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THE MODEL ENGINEER

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31ST JULY 1952 VOL. 107 NO. 2671

SMOKE RINGS

Our Cover Picture

● WE MAKE no apology for this week's photograph, as most model makers are interested in the old sailing ships. Our photograph shows one of the very few full-rigged ships in existence at the present day—the Norwegian training ship, *Sorlandet*. She was built of steel at Kristiansand in 1927, to dimensions 172.3 ft. long, 29.1 ft. beam and 16 ft. depth. She has no motive power other than her sails, but has generating plant for light and heat, and is fitted with radio. She has accommodation for 90 cadets who sleep in hammocks in the 'tween decks. The boys, whose ages range from 15 to 18, are being trained for service in the Norwegian Mercantile Marine. The training includes a summer cruise, during which foreign countries and cities are visited.

On the outbreak of war the ship was taken over by the Norwegian Navy and consequently fell into the hands of the Germans when Norway was invaded in 1940. The Germans removed the masts and used it as a store ship and ferry in the far North, where, in 1944, it was sunk by Russian bombers. After laying submerged for ten months, the Germans raised it and towed it to Kristiansand, where it was recovered by the Norwegians on the cessation of hostilities. It was in a very dilapidated condition. However, the directors took it over again and decided to have it completely refitted. War insurance provided some, but by no means the whole, of the money required, but the refitting was done very thoroughly, as will be realised at once on going on board.

Some of our readers may be interested to know that the August issue of our companion magazine, *Model Ships and Power Boats*, will contain a number of outstanding photographs of this lovely little ship.

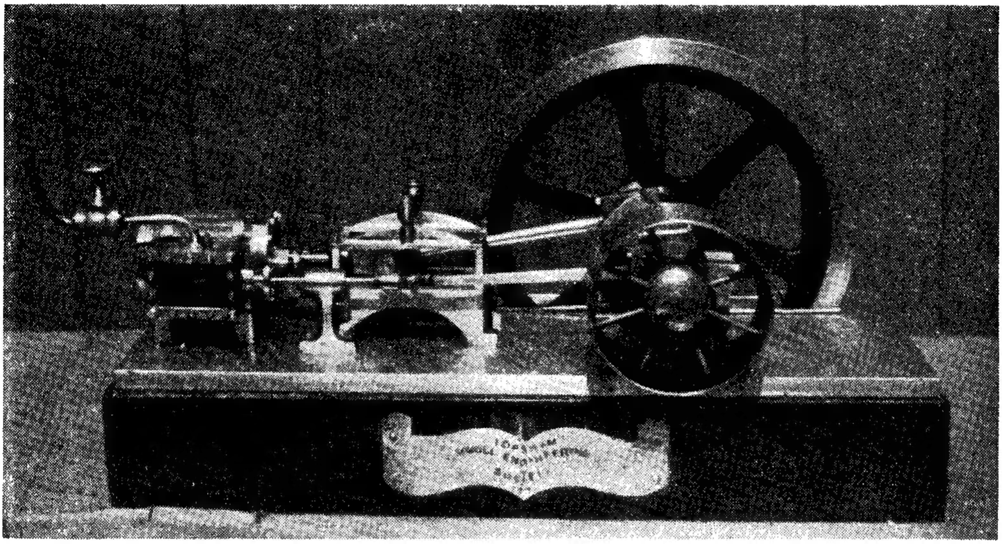
The photograph is reproduced by courtesy of the Port of London Authority.

Exhibition at Erdington

● THE SUTTON Coldfield and North Birmingham Model Engineering Society will be holding its fourth annual exhibition at the Church House, Erdington, Birmingham 23, on October 2nd, 3rd and 4th next. The Lord Mayor of Birmingham has promised to perform the opening ceremony. No doubt, the times of opening will be announced later; meanwhile, the chairman and exhibition organiser, Mr. J. James, 44, Lyndhurst Road, Erdington, Birmingham 24, will be pleased to provide any further information.

An Unusual Club Model

● THE MODEL mill engine seen in the reproduced photograph is the result of the efforts of a number of members of the Topsham Model Engineering Society. The cylinder is $1\frac{15}{16}$ in. bore by $2\frac{1}{2}$ in. stroke; the flywheel is 10 in. diameter and 1 in. wide. The bedplate is $\frac{1}{2}$ in. thick, scraper-finished, and the box-bed is of polished wood. Almost the whole of the model was fabricated; for example, the flywheel was cut out of 1 in. thick steel plate, which must have meant a good deal of work for somebody!



We are pleased to learn that the Topsham society, although founded only as recently as January last, is making steady progress; Mr. G. W. Bell says that a cordial invitation is extended to anyone else to go along to the clubroom, Heywoods Dock, Ferry Road, Topsham, on Friday evenings at 7 o'clock

That Awful Noise!

● ARISING OUT of our recent note about noise holding up progress, we are rather surprised to find that there are, it seems, many people who hold the opinion that we are making too much fuss about the matter. Let us make it quite clear that the heading to our note, "Noise Holds Up Progress," was chosen with the small i.c. engine alone in mind; we think this was only natural, in view of the fact that our comments were written because we had heard of another official ban being placed upon the building of a miniature car racing track. We have no complaint to make against the authorities concerned; they acted, as they thought, in the interests of the feelings of local residents, and we do not propose to make any comments on that action, nor do we think it necessary to alter our note.

The subject of noise, generally, is a very wide one, however, and we sympathise with any public body that seeks to prevent any addition to the noises which cause so much discomfort and inconvenience to so many people. What we would complain of is the fact that no public bodies took steps many years ago to stem the growth of so much noise. We are not suggesting that nothing was done; motor vehicles, for example, are compelled by law to be fitted with silencers, though it seems that some of those silencers are, by a long way, less efficient than the machines they are supposed to silence! But, if the law insists that silencers be fitted to motor vehicles, then why should other i.c.-engined contraptions be not similarly equipped?

Perhaps the worst offender today is the aeroplane; no matter whether it is i.c.-engined or jet-propelled, one of its chief delinquences is the noise it makes. This noise is one of the most sinister of modern sounds, and it has a habit of obtruding its unwelcome presence upon a long-suffering public just when it is not wanted! It all-too-frequently ruins a church service, a fine radio programme, a B.B.C. news broadcast or an afternoon nap, not to mention the effect it can have upon a case of serious illness. And yet, apparently, there is nothing that anyone can do about it!

Public authorities are becoming more and more alive to the fact that there is already too much noise in the everyday existence of most of us, and while little or nothing can be done to lessen it, something can be, and is being done, to prevent additions to the existing amount of noise. Model car enthusiasts, therefore, should not waste time in bemoaning their lot, but should take the lead in making their model cars blameless.

"The Portable Steam Engine"

● WE HAVE received a number of letters enquiring as to where it is possible to obtain copies of the book, *The Portable Steam Engine*, recently mentioned by Mr. W. J. Hughes. The Technical Press Ltd., who published the book, inform us that it is now out of print, but they are considering a reprint of it; the time delay, however, is likely to be up to twelve months.

More Models of the North

"Northerner" gives a final review of the 1952 N.A.M.E Exhibition

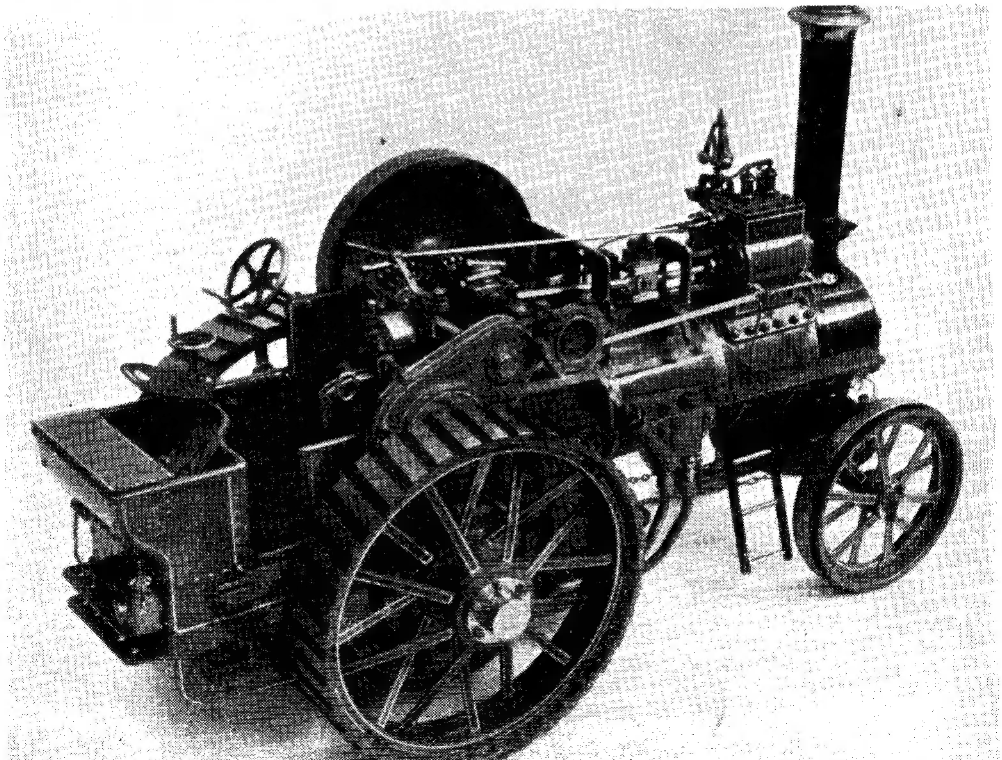
(Photographs by the Author)

THERE were not many traction-engines at the 1952 N.A.M.E. Exhibition, and of these the best was judged to be the model by A. G. Bates of Stoke (Photograph No. 1), a version of the "M.E." inch-scale design. Mr. Bates had made several alterations to the original design, in order to make it resemble the Paxman prototype more closely, but even so several more could well be carried out. These include trunk-guide instead of slide-bars, spoked flywheel, pump mounted on hornplate instead of on boiler barrel, more shapely cylinder block, and alteration of the governor, which should be a Pickering, but actually resembles no particular prototype.

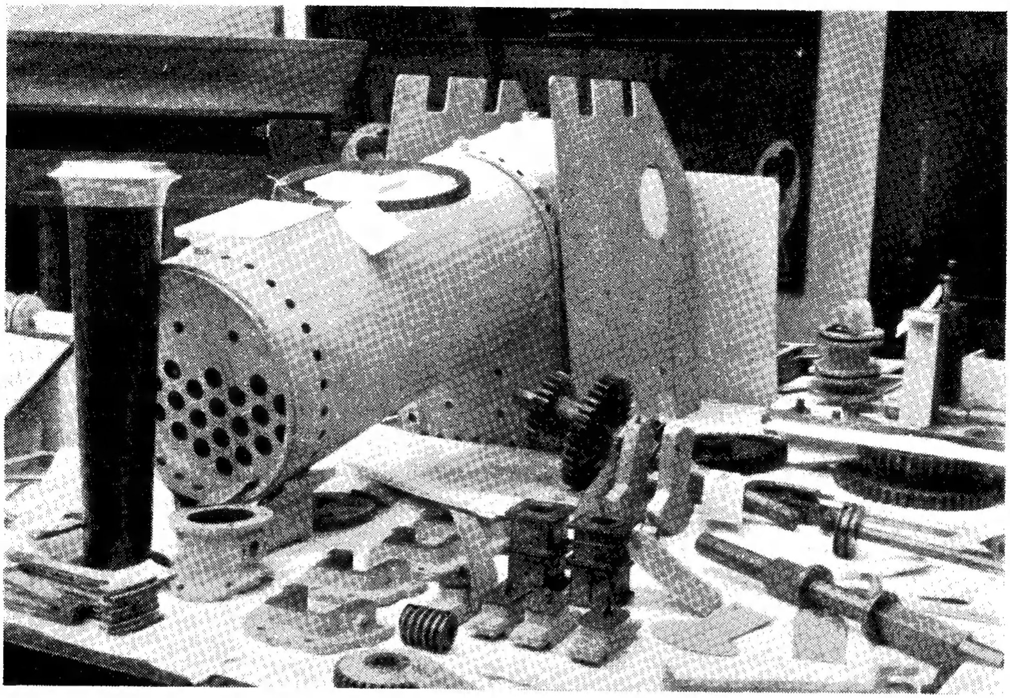
Notwithstanding these criticisms, the model was very nicely finished and full of detail, and was well worth looking at and worthy of its prize.

A 4-in. scale traction-engine is rather out of the ordinary, and that being built by F. Wightman caused much comment, although only the unassembled parts were on view (Photograph No. 2). No particular prototype is being followed, but general traction-engine practice is being carried out. To give some idea of the magnitude of the task, the boiler barrel is 13-in. in diameter and 27 in. long, with a firebox wrapper 13-in. long. The chimney is 20 in. high without its base casting.

This should be a very fine and imposing piece of work when complete, and I look forward to



Photograph No. 1. A well-detailed and nicely-finished 1-in. scale traction-engine by A. G. Bates was awarded first prize in its class



Photograph No. 2. Some of the parts of the 4-in. scale traction-engine being built by F. Wightman

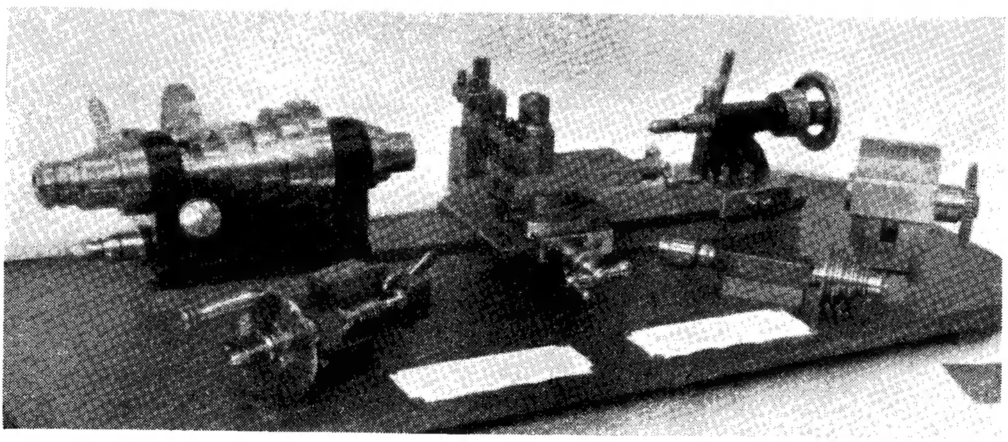
seeing it, and, perhaps, driving it on some future occasion.

Machine Tools

First prize winner in the workshop tools was W. D. Thompson of Leigh, with his parts for a lathe (Photograph 3). The machining and finish were of a very high standard, almost all having been done on a cheap lathe (bought for £6 7s. 6d. in 1936), and drilling machine.

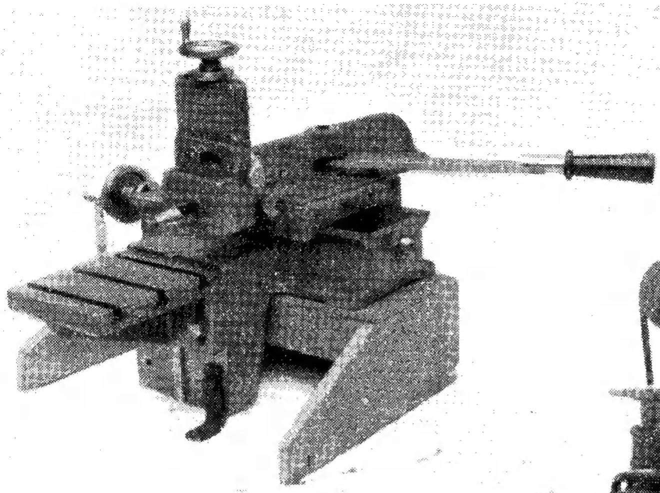
The design and the drawings (which also were excellent), were the work of the exhibitor, and fabrication was used extensively—for example, the headstock was built up from steel bar, with bearing brackets welded on. The only castings used are the handwheel and barrel guide on the tailstock, and a slab of scrap cast-iron for the lower slide on the compound rest.

Fittings include a drilling spindle, back tool-post, vertical milling-slide, and dividing-head,

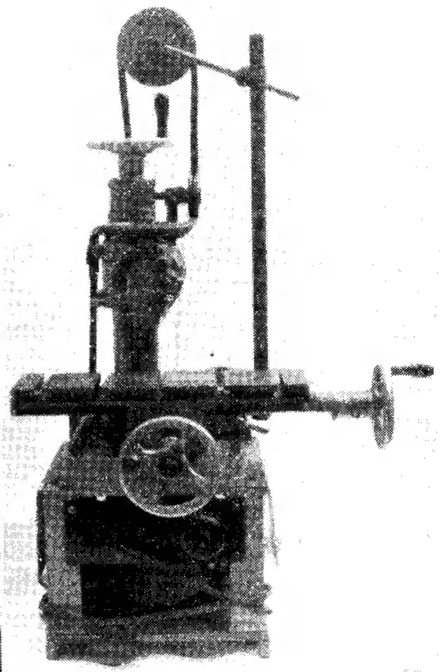


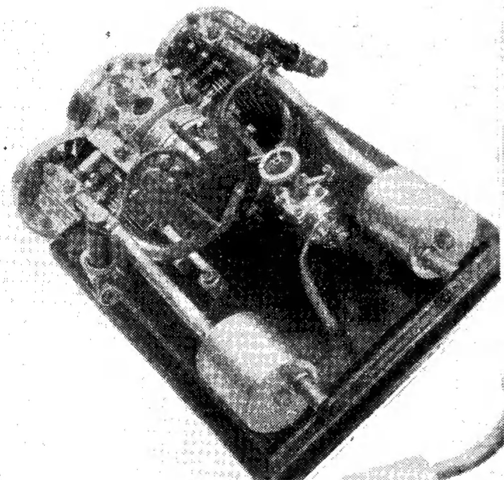
Photograph No. 3. Beautifully-finished lathe parts by W. D. Thompson, who has used largely scrap material in their construction

Below—Photograph No. 4. A useful milling-machine, with universal mounting for the spindle, by A. W. G. Tucker, of Bramhall

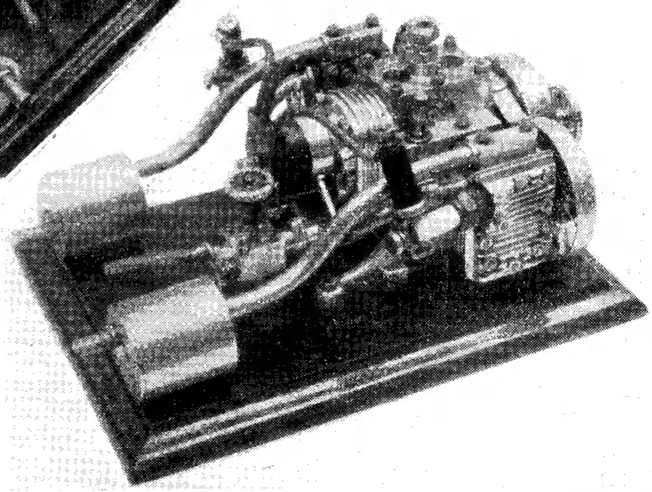


Photograph No. 5. Shown on a temporary wooden mounting, this hand-shaper by E. Hinchliffe, was a sturdy-looking tool

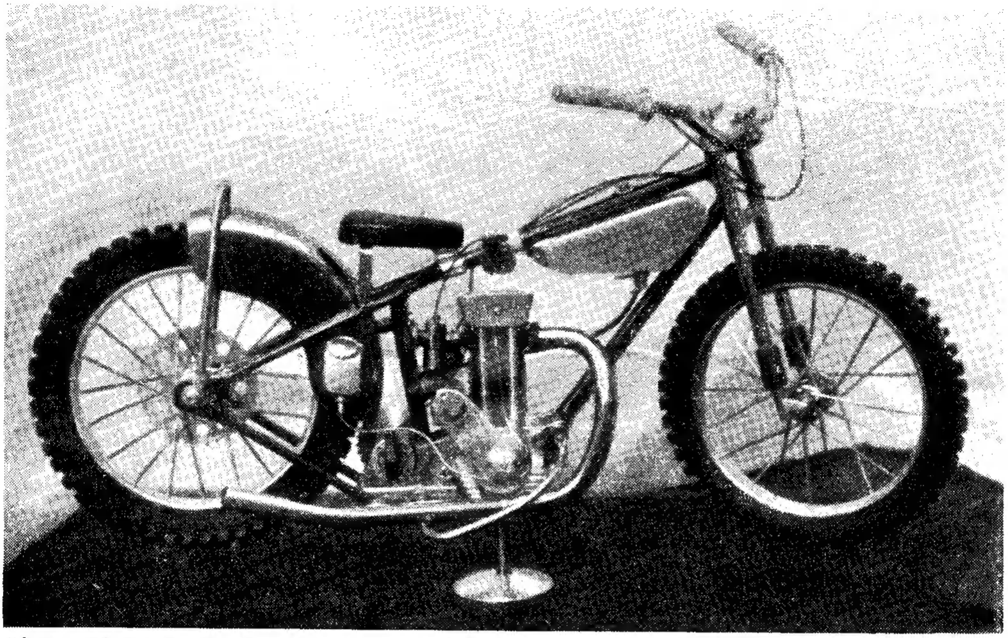




Above—Photograph No. 6. This view of W. Ogden's 14-c.c. two-cylinder engine shows well the neat layout



Right—Photograph No. 7. Another view of the well-finished 14-c.c. petrol engine



Photograph No. 8. The tiny "speedway racer" by Lars Bogendal. The tyres appeared to be turned from wood, on very close inspection

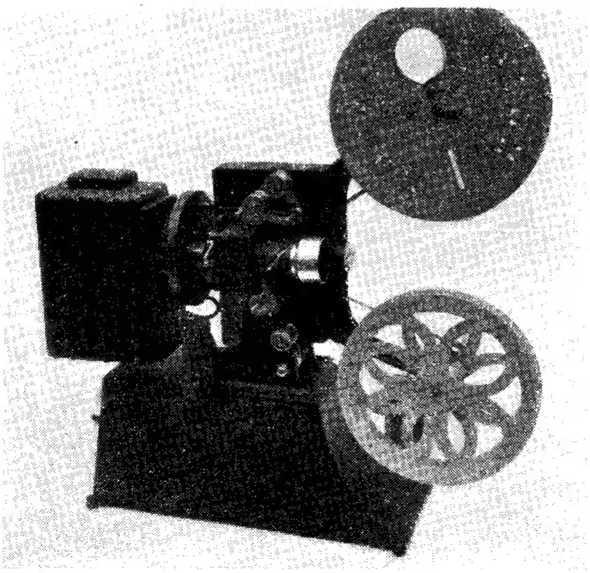
the latter having been made partly to enable the back gears to be cut.

An ingenious milling-machine won second prize for A. W. G. Tucker of Bramhall, builder of the well-known "Anna" series of locomotives. The milling-spindle head was universally mounted, so that milling may be carried out horizontally, vertically, or obliquely as desired

In this class also, a watchmaker's lathe, a vertical slide with dividing-head, and a hand-shaper were exhibited by E. Hinchliffe, of Rochdale, and were jointly awarded third prize. Shown in Photograph No. 5, the shaper, of 6-in. stroke, was a fine sturdy machine, and should be a useful adjunct to its owner's workshop.

An Unusual Petrol Engine

An out-of-the ordinary petrol-engine was that shown by W. Ogden, of Oldham. Of 14 c.c., the engine was air-cooled by twin fans, which were friction-driven from the flywheel periphery. The side-valve cylinders were horizontally opposed, and neat twin silencers were fitted. Finish was excellent, and the engine deservedly won first prize in its class.



Photograph No. 9. A good example of the "M.E." cine-projector by P. G. Clayton, of Orford

A "Speedway Racer"

As mentioned in a previous article, there were several "International" models at the Northern Exhibition, and of these a very neat example was the miniature J.A.P. speedway motor-cycle by Lars Bogendal, of Johanneshov.

Beautifully finished, and in a glass case, this model was excellently detailed, being only a few inches long. Obviously the builder had studied his prototype well, and the model

was awarded a third prize (Photograph No. 8).

Other Models

There were, of course, many other fine examples of craftsmanship at the exhibition, but I have space left for only two.

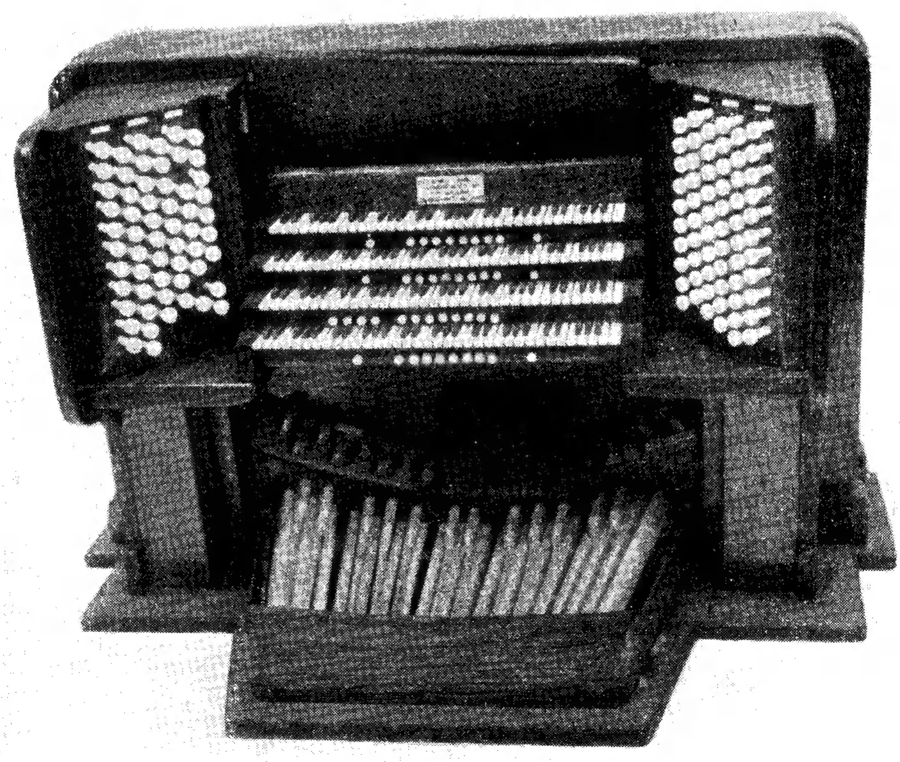
Photograph No. 9 shows a typical example of the "M.E." cine-projector, construction of which was described by "Kinemette" nearly twenty years ago in this journal. (Incidentally, it would be interesting to know just how many of these machines have been built during those years!) That now illustrated was built by P. G. Clayton of Orford, apparently without modification from the original, and was awarded first prize in its class.

And finally, I could not resist that fascinating model of a four-manual concert organ console by A. M. Wilson, of Bury (Photograph No. 10), although one felt that the finish could have been improved perhaps. The model was nicely made, chiefly in figured oak, and the prototype was well represented. Some neat lettering was apparent on the "stops," which were ingeniously made, unless my impression was wrong, from saccharin tablets! This model, too, was a prize winner, by the way.

Conclusion

Looking back on the whole exhibition, it was without doubt an outstanding event, and the constituent societies of the Northern Association are to be congratulated not only on the very high standard of craftsmanship displayed, but also on the general organisation. It is sad to know that one of the architects-in-chief, Mr. R. Lawton, the exhibition manager, is no longer with us, and he will be greatly missed not only by his northern colleagues, but by the wide circle of friends with whom the N.A.M.E. brought him in contact.

Nevertheless, the example of hard work and steadfast purpose set by him will spur on his successors, and year by year the Northern Exhibition will be a tribute and a monument to his memory. I feel sure that he would ask no better.

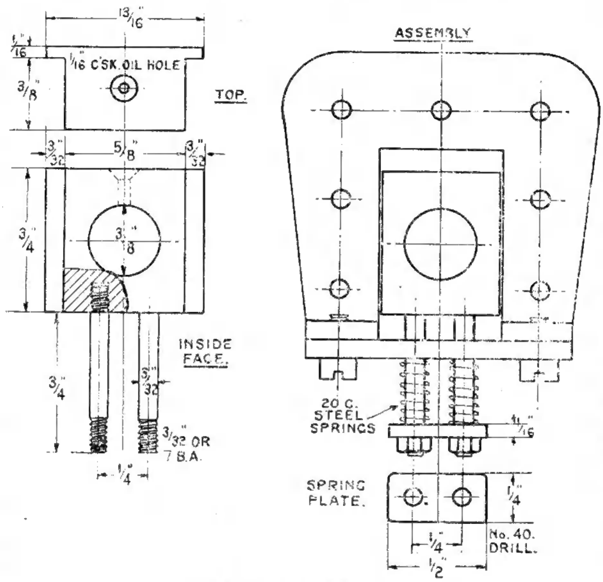


Photograph No. 10. In this realistic model of an organ console, the stops appeared to be made from very unorthodox material! See text

The "Canterbury Lamb" in $3\frac{1}{2}$-in. Gauge

by "L.B.S.C."

ALTHOUGH the weekly dose of writing and drawing is a burden—I would far rather build a locomotive than make drawings and write a description—I must confess that in the present instance, the burden has been lightened a wee bit by "day-dreaming." In my mind's eye, I can picture the rejuventated old "Canterbury Lamb" snorting up the stiff bank to Tyler Hill Tunnel, in a "business-only-meant" manner, by aid of 200 lb. of redhot steam (somewhat different to the 40 lb. of washday variety which the original boiler had a job to produce !) and then careering along the flat at a seventy-mile-an-hour bat ; and it has brought forth a few chuckles. Well, the good folk who build the $3\frac{1}{2}$-in. *Invicta* will translate that day-dream into a reality, in a manner of speaking, as the little engine will be able to put up a performance that far exceeds any flight of fancy of the original designers and builders of them.



Axleboxes details

The next job is the axleboxes, and these are of the single-flange kind, which I have used for $2\frac{1}{2}$-in. gauge engines, where the space between frames is much more restricted. Double-flanged ones couldn't be used, anyway, with the sheet-metal hornblocks, as the inner flange wouldn't pass the feet or lugs. I expect our approved advertisers will be able to supply the four boxes in a stick ; but if they don't, bar material of $\frac{7}{16}$ in. × $\frac{7}{8}$ in. section, or nearest larger, can be used. Bronze or gunmetal will, of course, be best ; but if not available, use brass, or whatever else is handy, and bush the axle holes with bronze or gunmetal. White metal, as used for automobile engine bearings, could also be used. This can be bought in cakes, or small slabs, and melted down in your brazing forge, by aid of a plumbers' ladle and a blowlamp. A cardboard tube makes a good mould for casting sticks.

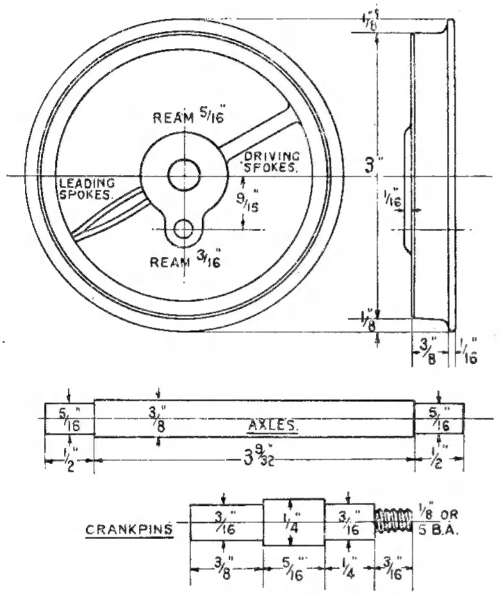
The axleboxes are made pretty much the same as fully described for *Tich.* Briefly, mount the stick, or piece of bar long enough for the four boxes, at the proper height on the top-slide of the lathe, holding down with the tool clamp, and setting the work at right-angles to the lathe bed ; then traverse across an end mill, or home-made slot drill, held in the three-jaw. This should be not less than $\frac{1}{2}$-in. diameter, and it should form the rebate at one cut. When doing the second side, use a gauge made from a piece of sheet metal about $\frac{1}{16}$ in. thick, with an opening filed in it, the same size as the axlebox openings in the frame. The boxes should fit the horns easily, but without shake. Fit one to each hornblock, and mark them ; then centre Nos. 1 and 2, drill No. 30, and use the drilled boxes as jigs to drill their opposite mates. Mount temporarily in frame, and test for alignment with a piece of $\frac{1}{8}$ in. silver-steel through the holes ; if O.K. open out with 23/64 in. drill, and ream $\frac{3}{8}$ in. Drill the oil holes, then put each box in place, jamming it against the hornstay ; put the No. 40 drill through the centre holes in hornstay, making countersinks on the bottom of the axlebox. Follow up with No. 48 drill, tap 3/32 in. or 7 B.A., and fit spring pins of 3/32 in. silver-steel, screwed at both ends as shown in the illustration.

The spring plates are made from $\frac{1}{4}$ in. × $\frac{1}{16}$ in. steel strip, as shown in the assembly drawing ; the springs are wound up from 20-gauge tinned steel wire, around a piece of 3/32 in. round steel. The spring plates are fixed by ordinary commercial nuts, and the illustration shows the complete assembly. After erecting the boxes, put a little bit of $\frac{1}{8}$ in. rod (square for preference) between axlebox and hornstay, and tighten the springs well ; this will hold the wheels in running position whilst the cylinders and motion are

being erected, and the valve-gear adjusted. Novices and tyros won't need reminding that the axlebox flanges go outside the frame, for the boxes can't be erected with the flanges inside!

Wheels and Axles

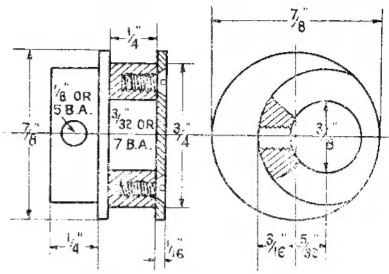
The wheels are 3 in. diameter on tread, but instead of specifying $\frac{5}{16}$ in. width of tread as on *Rainhill*, I have widened it to my "standard" of $\frac{3}{8}$ in. This makes the engine keep the road better, on a line suffering from spread rails. The effect of alternate sunshine and rain, on rail screws and spikes, tends to loosen them, and a heavy load on passenger cars will spread the gauge, especially on curves; and an engine with a short wheelbase like *Invicta*, will easily slip



Wheels, axles and crankpins

down between the spread rails, if the wheel treads are narrow. Wheel castings as supplied for *Juliet* can be used, but I shouldn't be at all surprised to find our advertisers supplying the correct pair of odd ones (says Pat). Angus Mc. Wilwau will probably try to pull a fast one on his friendly Sassenach accomplices, same as he did with the motion brackets for *Britannia*—but, oh boy! I'd love to see his face if they get in first! The shapes of the two kinds of spokes are shown in the drawing of the wheel; there are no balance weights at all.

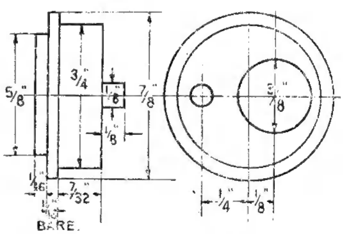
The wheels are machined in the same way as fully described for *Tich*. Briefly, chuck in three-jaw by tread, and face off the back; centre, drill 19/64 in. and ream $\frac{5}{16}$ in. Take a rough cut off edge of flange. Reverse in chuck, turn outside of rim, and face the boss. Mount each on an improvised faceplate (old wheel casting, iron disc or anything similar) held in three-jaw, with a screwed peg in the centre, having a nut to clamp wheel in place; then turn tread and flange, finishing treads without shifting the cross-slide, so that all four wheels cannot help being exactly the same diameter. Beginners and other inexperienced workers should



Pump eccentric

bear in mind that slow speed is essential for turning cast-iron wheel treads and flanges, and it is hopeless to attempt it on a flimsy "baby" lathe without back gear, by the ordinary means. The job *can* be done on such a machine, by putting a big handle on the outer end of the mandrel, and turning it slowly by hand, preferably getting somebody else to do that job, whilst you concentrate on the other kind of turning.

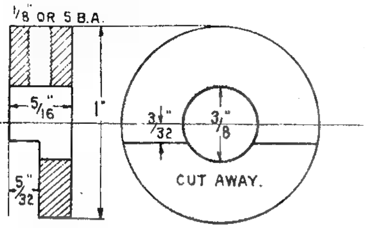
The crankpins are turned from $\frac{1}{4}$ in. round steel, held in three-jaw, to dimensions given in the illustration; a kiddy's practice job requiring no detailing. Note that big-end and coupling-rod bearings run on different diameters. This is because the connecting-rods are *inside* the coupling-rods, contrary to the usual practice. A distance-piece could, of course, be placed between the coupling-rod and the boss of the leading wheel, over a parallel crankpin; but as I like a good hefty big-end bearing ("the choice of experience," as the Reeves advertisement says)



Valve eccentric

and have allowed for this on the driving pin, we might as well turn the leading pins to the same dimensions, dispensing with the need for a distance-piece, and getting a stronger pin, in addition. The holes in the wheel bosses, for the crankpins, are drilled by jig, in the manner I have already described umpteen times, the jig being just a bit of $\frac{1}{2}$ in. $\times$ $\frac{1}{4}$ in. steel bar, with a $\frac{5}{16}$ in. peg at one end, and a No. 14 drill hole at $\frac{9}{16}$ in. away from it. Put the peg in the hole in

the wheel, drill through the small hole into the wheel boss, taking care to have the jig central with same, and then put a $\frac{3}{16}$ in. parallel reamer through the hole in the boss of the wheel. Squeeze the crankpins into the wheel bosses, using the bench vice as press, and putting a brass nut on the crankpin to avoid damaging the threads.



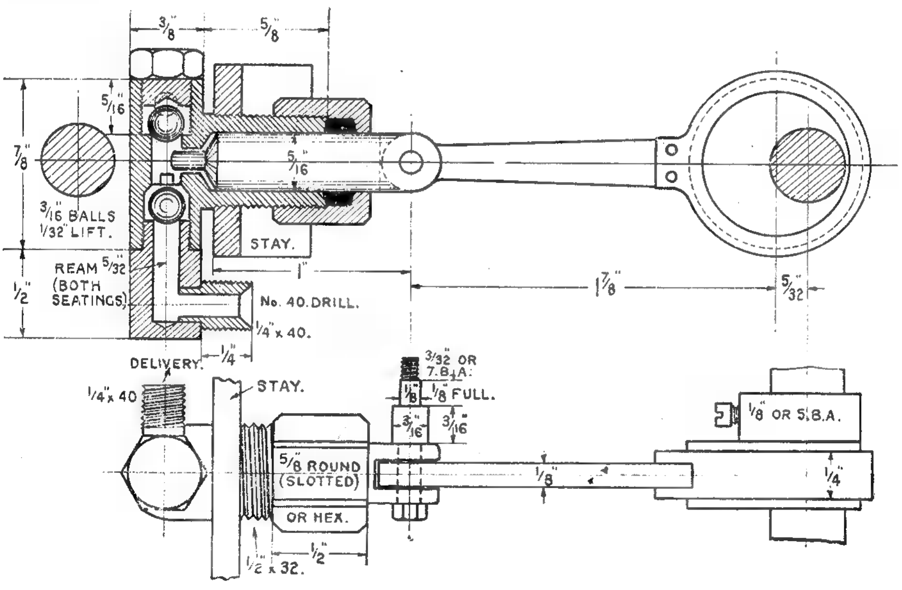
Stop collar

The axles are turned from $\frac{5}{8}$ in. round steel, a described for *Tich*, to the dimensions shown. One wheel can be pressed on each axle, at this stage; leave the other for awhile, until the eccentrics and stop collars are ready.

Eccentrics

Three eccentric sheaves are needed, two for valve-gear and one for feed pump; also, two turned from $\frac{7}{8}$ in. round mild-steel rod held in three-jaw. For the valve eccentrics, face the end, turn down 7/32 in. length to $\frac{3}{4}$ in. diameter, part off at $\frac{1}{8}$ in. from the shoulder, reverse in chuck, and reduce $\frac{1}{16}$ in. of the other end to $\frac{5}{8}$ in. diameter. This forms a boss which bears against the axlebox, and keeps the eccentric clear of the hornblock lugs. The true centre of the doings will be indicated by the toolmarks. Scribe a line through this, and make two centre-pops, at $\frac{1}{4}$ in. and $\frac{1}{8}$ in. respectively, each side of the true centre. Drill a No. 32 hole through the first, and squeeze in a bit of $\frac{1}{8}$ in. silver-steel for the stop pin, letting it project $\frac{1}{8}$ in. as shown. Then chuck the eccentric in four-jaw, with the other pop mark running truly. Drill right through with No. 30 or $\frac{1}{8}$ in. drill, open out with 23/64 in. drill, and poke a $\frac{3}{8}$ in. parallel reamer through. The eccentrics should be free on the axles, without being sloppy. If too tight, the engine won't reverse; and if too slack, you'll get bad valve events, and the engine won't perform to expectations.

To turn the pump eccentric, first face off, and turn the end to $\frac{3}{4}$ in. diameter for $\frac{1}{2}$ in. length, parting off at $\frac{5}{16}$ in. from the shoulder. Make a centre-pop 5/32 in. off centre, chuck in four-jaw with the pop mark running truly, and drill and ream as above. Now mount it on a stub mandrel—a bit of $\frac{1}{2}$ in. rod, with the end turned to a drive fit in the hole in the eccentric—with



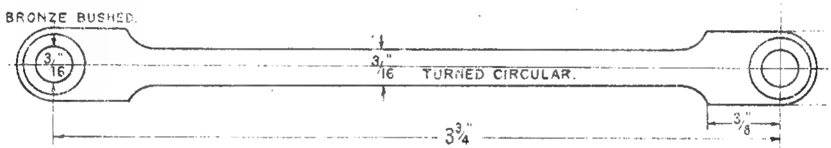
Details of feed pump

stop collars. These must be mounted on the driving axle before the second wheel is pressed on. Owing to the limited headroom between the axles and the bottom of the boiler, we shall have to use plain ring-type eccentric straps; and to get these on to the sheaves, the valve-gear eccentrics only have one flange, whilst the pump eccentric has a detachable flange. All three are the unturned end outwards; hold the mandrel in three-jaw, with the eccentric touching the chuck jaws, and turn down $\frac{1}{4}$ in. length, until the boss is $\frac{3}{16}$ in. thick at the wider side of the eccentric; see side view. The boss will then look like a waning moon, but that doesn't matter a Continental; just drill and tap a $\frac{1}{8}$ in. or 5 B.A. hole through the thickest part, as shown. Chuck

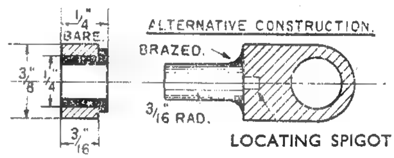
the $\frac{7}{8}$-in. rod again, and part off a $\frac{1}{16}$-in. slice, or cut a $\frac{7}{8}$-in. disc from 16- or 18-gauge sheet steel, just as you fancy. Attach this to the eccentric by three or four 3/32-in. or 7-B.A. screws, as shown, put the drill and reamer through, using the hole in the eccentric as guide, and Bob's your uncle once more, as far as that part of the proceedings is concerned.

Stop Collars and Straps

The stop collars are nothing to worry about; just chuck a piece of 1 in. rod, brass or steel, face the end, centre, and drill with 23/64-in. drill to about $\frac{7}{8}$ in. depth. Part off two $\frac{5}{16}$-in. slices. Saw and file—or mill, if you have the means of doing so—two segments as shown, 5/32 in. deep, and extending to within 3/32 in. of centre-line. Drill and tap a $\frac{1}{8}$-in. or 5-B.A. hole in the thick part directly opposite, as shown in the illustration, and ream the centre-hole $\frac{3}{8}$ in.



Details of coupling-rod



The eccentric straps, each being in one piece, must be fitted to the sheaves before they are mounted on the driving axle. They are just plain rings, with a boss for the attachment of the rods, and may be turned up from castings, or from 1-in. rod, with bosses made from little blocks of brass, silver-soldered on. In either case, chuck in three-jaw, face off, and bore to a nice running fit on the eccentrics. If rod is used, part off to length, $\frac{1}{4}$ in. bare for pump, 7/32 in. bare for valves. The bosses should be $\frac{1}{4}$ in. long, $\frac{3}{16}$ in. wide, and same thickness as width of strap. If castings are used, face the unturned side either on a stub mandrel, or by holding the casting on the smallest step of the inside jaws of the self-centring chuck. I have a little three-jaw $2\frac{1}{2}$ in. diameter, which is mighty handy for holding little rings, and I always use it for facing the sides of eccentric straps. The boss of the pump strap is slotted $\frac{1}{8}$ in., and an eccentric-rod made from $\frac{1}{8}$ in. flat steel, riveted and sweated into the slot, as shown in the pump drawing. The hole in the eye is reamed $\frac{1}{8}$ in. The bosses of the valve eccentric straps, are drilled and tapped $\frac{1}{8}$ in. or 5 B.A., to take a $\frac{1}{8}$ in. round eccentric-rod, to allow for adjustment when setting valves.

To erect the driving axle, poke one end through the axlebox, then decorate it in the following order; first, valve eccentric with boss next to axlebox; next, stop collar with cut-away part over the eccentric-pin; next, pump eccentric complete; next, stop collar with flat side next to pump eccentric; finally, the other valve eccentric, with the boss next to axlebox. Push the axle right home, and put on the other driving wheel, setting the crankpins (right-hand leading) at right angles, with square and scribing-block, as fully described for *Tich*. Leave the leading wheels until the pump has been erected.

Feed Pump

There isn't such a wonderful lot to say about the pump, as it is one of my "standard" patterns (how I *hate* that word!) similar to that described for *Tich*, but there are one or two variations, to which I'll call attention. The barrel and valve-box can be machined up from a casting, as sold by our approved advertisers, or you can build it up from rod material, silver-soldering the bits together. If a casting is used, chuck by one end of the valve-box, and set the other end to run truly; face, centre, drill through with No. 24 drill, open out and bottom to $\frac{5}{16}$ in. depth with 7/32-in. drill, and D-bit, and tap $\frac{1}{4}$ in. × 40. Reverse, and mount on a stub of rod screwed $\frac{1}{4}$ in. × 40 at the end, then repeat operations, leaving out the D-bit. Ream the remains of the 24 hole with 5/32-in. reamer. Chuck by spigot on valve-box, set barrel to run truly, centre, drill No. 30 right into valve-box, open out to $\frac{5}{8}$ in. depth with $\frac{5}{16}$-in. drill, turn outside to $\frac{1}{2}$ in. diameter, and screw $\frac{1}{2}$ in. × 32. Cut spigot off valve-box, and clean up. Drill a 5/32-in. hole in the side of upper part, and fit a $\frac{1}{4}$-in. × 40 union screw in it, silver-soldering the joint. Fit $\frac{3}{16}$-in. ball and cap as shown.

The bottom fitting is made from $\frac{3}{8}$-in. hexagon brass rod, ball being fitted as described for *Tich*. The bottom part is $\frac{1}{2}$ in. long; screw in tightly, mark the facet under the barrel, and then remove the fitting, and silver-solder a $\frac{1}{4}$-in. × 40 union screw into it as shown. Replace ball and fitting when erecting. The ram is made from $\frac{5}{16}$ in. rustless steel or bronze rod, and should fit the barrel without turning, except for the anti-airlock pin; the outer end is slotted $\frac{1}{8}$ in. and cross-drilled No. 30. The gland is made from $\frac{5}{8}$ in. round rod, slotted for C-spanner, or from $\frac{5}{8}$ in. hexagon rod, as you fancy. The gudgeon-pin is made from $\frac{3}{16}$ in. round steel, and is stepped, like the main crankpins, as it is used to drive the

mechanical lubricator as well. The latter gadget on the old iron, is putting new wine into old bottles, with a vengeance! Screw the pump barrel through the stay before putting in the ram and packing the gland. The whole bag of tricks is erected, so that the valve-box clears the leading axle by $\frac{1}{16}$ in. When the rod is connected up, the ram should clear the end of the barrel by about 1/32 in.; see *Tich* notes.

Coupling-rods

The coupling-rods are made from two pieces of $\frac{3}{8}$-in. × $\frac{3}{16}$-in. mild-steel $4\frac{1}{2}$ in. long. Square off both ends, make a deep centre hole in each end, mount between centres, and turn the centre part round, for a length of 3 in. Drill two $\frac{1}{4}$-in. holes at $3\frac{3}{4}$ in. centres (check your axle centres for this) and fit bronze bushes as shown. Cut to length, and round off the ends. An alternate way of making the rods would be to make the ends separately, from $\frac{3}{8}$-in. × $\frac{3}{16}$-in. steel rod, and braze them to a 3 in. length of round steel, thus obviating any turning. Next stage will be the cylinders.

A USEFUL GUARD WHEN TURNING BRASS

WHEN turning hard brass, the small cuttings tend to fly off in all directions, and this causes much time and trouble in clearing up after the work is done. Apart from a mess, there is, of course, the danger of small cuttings getting into the eyes, which should be avoided as far as possible.

Often turners make use of a piece of tin or thin cardboard held in the tool rest, and this is bent over the work to keep down the cuttings. A much better method of overcoming trouble of this kind is to make a guard which can be added to the general tool kit.

The guard illustrated by Fig. 1, is ideal for the job, and a window is provided which allows the turner to keep an eye on the cut. You will find plenty of odd pieces of thin metal suitable for the guard, which can be made in the following manner. No measurements are included for the guard, but if the shield part is made about $2\frac{1}{2}$ in. wide and allowed a length so that the end bends well over the work, it will have the effect of keeping the cuttings from flying up. The piece of metal for the shield *X* (view *A*, Fig. 2) is provided with a square cut-out in order to allow for a window. The window can be a piece of Perspex which is held in position by two strips *Y* (views *A* and *B*, Fig. 2), shaped and soldered to the shield. The shield is fixed to a flat piece of metal Z, with two or three small rivets which allows for the guard to be held in the tool rest along with the cutting tool. The guard can readily be adapted for work done on the face-plate or in the chuck, in cases where small flying cuttings are produced when machining such metal as hard brass and the like. — W. J. SAUNDERS.

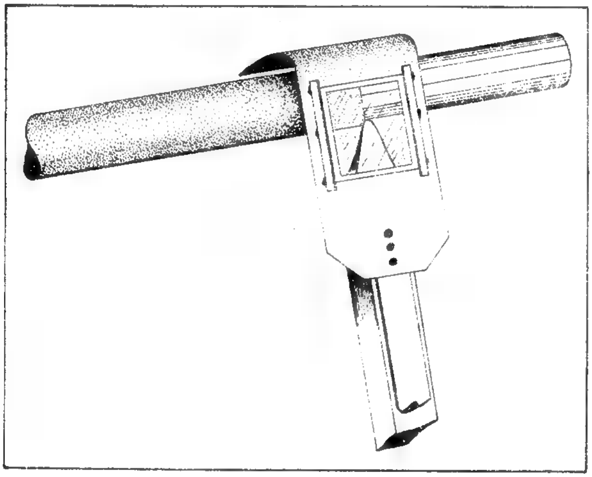


Fig. 1

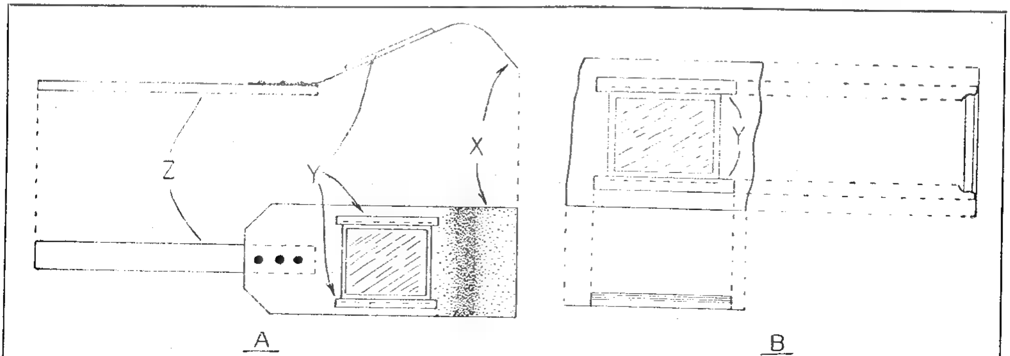
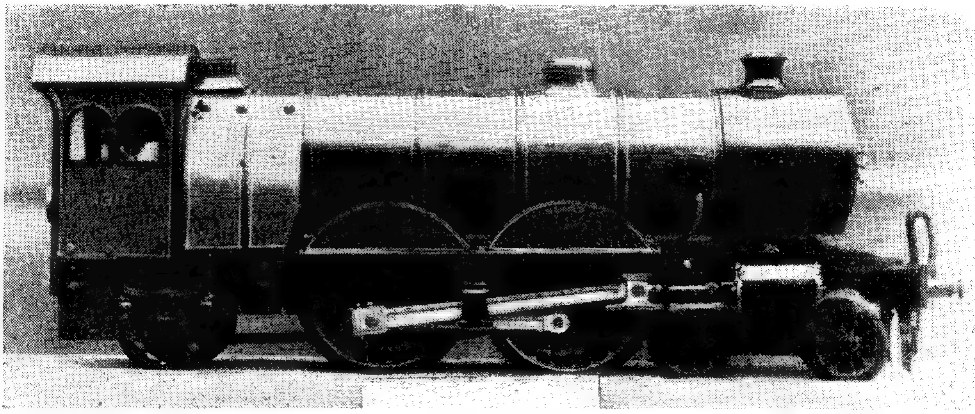


Fig. 2



Harold's " Atlantic " with the original splashers replaced

Early Passenger-Hauling on $2\frac{1}{2}$-in. Gauge Track

by A. L. Lee

FOR many years past reference has been made in THE MODEL ENGINEER to the question of early passenger-hauling on $2\frac{1}{2}$-in. gauge track.

In his " Practical Letter," THE MODEL ENGINEER, August 25th, 1949, our friend " Curious " of Eccles, stated that passenger-hauling on $2\frac{1}{2}$-in. gauge track was unknown in 1912-1913.

In January, 1930, a well-known contributor to THE MODEL ENGINEER claimed that he built the first " Steam Passenger Hauler," on $2\frac{1}{2}$-in. gauge track and gave some details of his engine. So far as I know, his claim has never been disputed in THE MODEL ENGINEER, and he has been credited with that honour ever since.

I do not uphold his claim, as to my knowledge, he is far behind.

The question is " who did build the first steam passenger-hauler on $2\frac{1}{2}$-in. gauge track using loco-type boiler, burning solid fuel and water feed pump fitted between the frames ? "

I think that every reader will agree with me, " Let the credit go to whom it is due."

On behalf of my late brother, " Harold," it is my duty to make the following claim.

I, A. L. Lee, claim that Harold Lee, born October 30th, 1892, died May 8th, 1911, built the first $2\frac{1}{2}$-in. gauge passenger-hauling model steam locomotive having the following features.

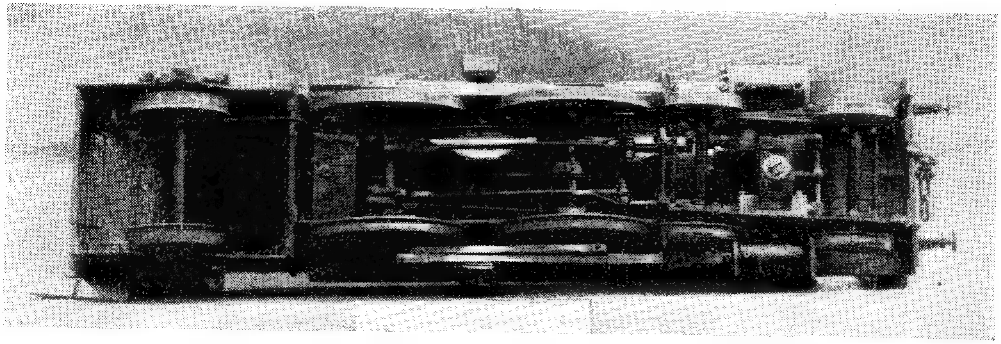
(1) Locomotive-type boiler, riveted throughout and burning solid fuel (coal).
(2) To have its own water-feed pump fitted between the frames.
(3) Steam taken from the dome.
(4) The boiler completely lagged.

I submit further details of this locomotive :—

Type, Atlantic ; Boiler, $2\frac{3}{4}$ in. dia., $9\frac{1}{4}$ in between tube plates, twelve $\frac{3}{8}$ in. dia. flue-tubes, 36 boiler stays ; Heating surface, $112\frac{1}{2}$ sq. in. ; Cliynders, $\frac{5}{8}$ in. bore $\times$ 1 in. stroke ; Working pressure, 75-80 lb. per sq. in ; Driving and coupled wheels, $3\frac{1}{4}$ in. dia. ; Bogie wheels, $1\frac{1}{2}$ in. dia ; Trailing wheel, 2 in. dia. ; Date of construction, 1908-1910.

If any models were built before this locomotive

The late Harold Lee with his " Atlantic " disguised in disgust by the builder fitting a N.E.R. cab and splashers to a G.N.R. locomotive



Underview, showing pump bracket (in front of throat plate) and eccentric driving the pump from coupled wheel axle

to which I refer and are passenger-haulers, I am prepared to withdraw this claim.

If, however, this claim is upheld, I would ask the Editor's indulgence that it be acknowledged in THE MODEL ENGINEER, so that a copy can be placed in the case with Harold's engine.

It will be of further interest to me to know who built the first 2½-in. gauge electrically-driven passenger-hauler. So far as I know, I believe I can claim this honour, but I stand to be corrected.

The model in question is a 10-wheeled tank locomotive built between 1908-1909. It was first seen in public at the Model Railway Club, February 3rd, 1921, and on February 10th, 1921, a photograph was taken of it hauling a truck of accumulators, with a 7-stone boy on top. This picture was published in THE MODEL ENGINEER on March 31st, 1921, and *The Daily News*, Feburary 15th, 1921. Also, in an evening paper about the same date an article appeared giving the reporters' experiences of riding behind such a small engine. (If any readers can provide me with details of this publication I would be obliged, as my copy was accidentally destroyed.) The engine was also working at THE MODEL ENGINEER Exhibition, January 5th-12th, 1923, when the late Henry Greenly had the misfortune to fall off, bringing the accumulator and engine with him. Together with Mr. Bassett-Lowke and Mr. Allman, Mr. Greenly had taken the engine over to carry out tests on it. No doubt many visitors to that Exhibition will remember the incident.

Subject, then, to any claim which predates the construction of my own locomotive (1908-1909), I, A. L. Lee, do claim to have built the first 2½-in. gauge model locomotive electrically-driven to haul passengers. If my claim is upheld, may I again ask that it, too, be acknowledged in THE MODEL ENGINEER ?

For the Bookshelf

The North Staffordshire Railway, by " Manifold." (Published by J. H. Henstock, Ashbourne, Derbyshire.) Fully illustrated. 182 pages. Coloured frontispiece. Price 25s. 8d. by post.

In these days, when the market is flooded with railway " literature " of more or less doubtful value, we are pleased and refreshed to find and to read this book which, without question, must be added to the really worthwhile railway histories. It is the combined work of five gentlemen who have lived on the line all their lives and have made N.S.R. matters their especial study and, in some instances, their means of livelihood. Consequently, the book not only breathes authenticity, from end to end, but it reveals itself as a labour of love on almost every page.

The North Staffordshire Railway, or " Old Knotty " as it was known to all who knew it best, was one of the minor railways of England before the grouping of the railways in 1922 ; but in its earlier years it fought hard for, and eventually won, a sturdy independence that made it a supremely important concern and endeared it to all who came into contact with it. Always well managed, it acquired a distinctiveness that was all its own, pervading the entire system and even its personnel.

The story of this is admirably recorded by the " Manifold " combine, who have accomplished the task most successfully ; what faults there are are faults of omission and may be due to causes over which the authors had no control. For example, the particulars and illustrations of the passenger and freight rolling-stock are rather meagre, and we think that the signals were worthy of greater description and more illustrations. These omissions are all the more striking in view of the remarkably complete history and very large number of photographs and drawings of the locomotives.

Perhaps, the ideal railway history has yet to be written, but this book takes a great stride towards it ; the text is simple, factual, straightforward and commendably restrained ; variations of style are not apparent, in spite of the unusual authorship, and sources of information are clearly stated wherever necessary. We feel that this is an important and valuable book.

Model Power Boat News

"Jinxes and Hoodoos!"

by "Meridian"

PART of the fascination of running model power boats lies in the chance element in the business. Model power boats, especially the racing variety, are unpredictable in their behaviour when running in competition. The mere presence of water, it seems, is enough to put a hoodoo on an otherwise well behaved engine or power plant! At home on the bench, engines start first pull and *never, never* stall—but with the boat hooked on the line it is another story; especially if there is a time limit in operation.

The experts are just as likely to be in trouble as the newcomer, and at regattas recently quite a few well-known exponents have failed to return a time on either of the two runs allowed. Among the sufferers this year is Mr. R. Phillips (S. London), whose *Foz 2* is right off form, although nothing drastic has been done to either engine or hull since putting up a Class "C" record of 69 m.p.h. at the Geneva regatta in 1951. Mr. G. Stone's *Lady Babs II* is proverbially unlucky at home regattas; although this is partly due to the hull, which rapidly becomes airborne unless the water is very calm.

Mr. Stone's other boat, *Lady Cynthia*, has now been modified by the addition of sponsons attached to outriggers, and looks like being a good boat for disturbed water conditions. Some good runs were made during practice recently without capsizing or "flipping."

The uncertainty of speed boat work is perhaps all to the good; at least it permits changes in the place order in different speed events, and any competitor whose boat completes the course has a chance of winning, as the "cracks" may fail to finish or perhaps record a slow time.

St. Albans and N. London Regatta

This joint effort was the second annual event by the St. Albans and N. London Societies, and it was held, as last year, on the lake at Verulamium, St. Albans.

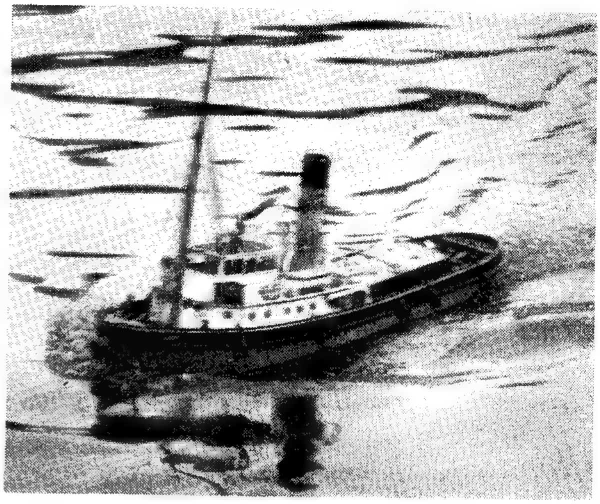
Many clubs were represented at this regatta, including Bournville, Bedford, Southend, Aldershot, Guildford and Southampton, as well as most of the London clubs. Apart from a shower of about 30 minutes duration, the weather was reasonable, and all events of a full programme were successfully completed.

A few of the competitors in the prototype events at St. Albans

The straight events were supported by over 20 entries, and keen competition was seen in both the Steering and Nomination. The old maestro, Ted Vanner, won the steering with *Leda III*, and the Nomination went to D. Green, of the Bedford club.

High speeds were attained in the speed events, especially in the "C" Restricted race, which produced the best speeds of the year for this class. E. Clark's *Gordon* 2 was also well on form in Class "A"; over 60 m.p.h. was recorded by this boat on the second attempt, after attaining 56 m.p.h. on the first run.

The Class "B" event produced a new competitor in J. Bamford (Aldershot), with a neat 15 c.c. two-stroke job. This boat attained 44.4 m.p.h. and took second place in the race.



The steam tug "Elsie" by Mr. Robinson, of the West London club

Results

Nomination Race 50 yd.

1. D. Green (Bedford): 0.95 per cent. error.
2. M. Drayson (N. London), *Nippy*: 2.14 per cent. error.
3. G. Jones (Victoria), *Regina*: 9.1 per cent. error.

500 *yd. Class "A" Race*

1. E. Clark (Victoria), *Gordon* 2: 62.3 m.p.h.
2. J. Benson (Blackheath), *Orthon*: 51.6 m.p.h.
3. K. Williams (Bournville), *Faro*: 46 m.p.h.

500 *yd. Class "B" Race*

1. G. Lines (Orpington), *Sparky* 2: 50.64 m.p.h.
2. J. Bamford (Aldershot): 44.4 m.p.h.
3. F. Jutton (Guildford), *Vesta III*: 35.03 m.p.h.

Steering Competition

1. E. Vanner (Victoria), *Leda III*: 11 points.
2. Lowe (St. Albans): 10 points.
3. F. Curtis (Kingsmere), *Korango*: 9 points.

500 *yd. Class "C" Race*

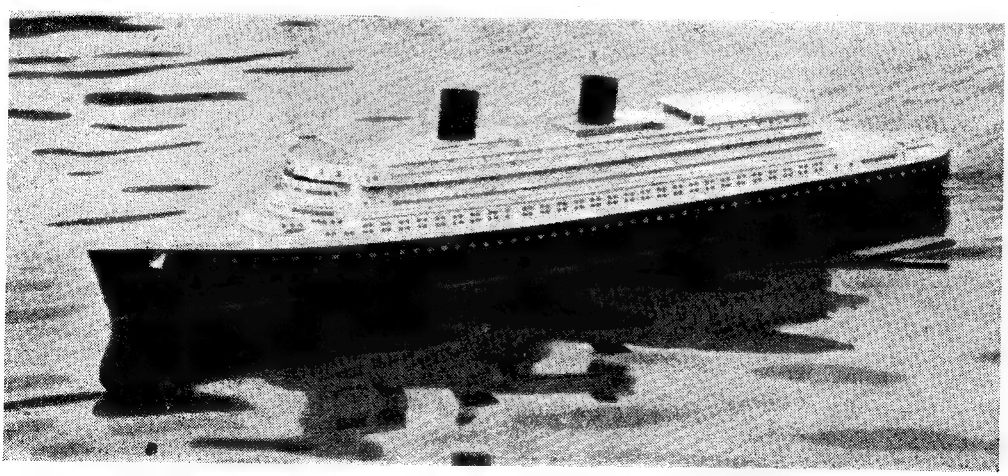
1. L. Pinder (Kingsmere), *Rednip* 7: 53.2 m.p.h.
2. C. Stanworth Sen. (Bournville), *May*: 35.1 m.p.h.

500 *yd. "C" Restricted Race*

1. W. Everett (Victoria), *Ann*: 63.9 m.p.h.
2. S. Poyser (Victoria), *Rumpus* 4: 57.4 m.p.h.
3. C. Hancox (S. London), *Lady Joan*: 54.4 m.p.h.

300 *yd.* Class *"D" Race*

1. K. Hyder (Victoria), *Slipper I*: 53.8 m.ph.
2. E. Woodley (Victoria): 39.8 m.p.h.



An unfinished steam-driven model of the "Queen Elizabeth," making a maiden voyage at St. Albans

Orpington S.M.F. Regatta

The Orpington Club are still without a home water, although attempts have been made to rectify this state of affairs.

This does not dishearten the boat members, however, although it must be a handicap to their activities.

With the assistance of the Victoria M.S.C., another successful regatta was held at Victoria Park, London, E., on a recent Sunday. There was a very large entry of straight-running craft, and Swindon and Cheltenham boats were well to the fore in the straight events.

The speed merchants had an off day; many boats failed to complete and there were many capsizes. An exception was E. Clark (Victoria) whose boat *Gordon* 2 completed two excellent runs. In the Class "C" event, only one boat finished out of some seven entries, and only two managed it in the Class "B" race.

In view of the fact that a well-wisher had given some extra prizes, it was decided to give them for fourth place in both the straight events, and this was a popular decision regarding the heavy entry.

Mr. J. B. Skingley (Victoria) with his motor launch "Josephine"

Results

Nomination Race 80 *yd.*

1. J. Burgess (Cheltenham), *Lady Maud*; 54 sec. actual; 51 sec. nominated.
2. A. Falconer (Blackheath), *Golden Maria*: 51 sec. nominated. (After dead-heat, both with nil error.)
3. E. Vanner (Victoria), *All Alone*: 27.2 sec. actual; 27 sec. nominated.
4. W. Hood (Swindon), *Truant*: 26.5 sec. actual 26.2 sec. nominated.

Class "C" Race 500 *yd.*

1. J. Benson (Blackheath), *Moth*: 32.5 m.p.h.

"C" Restricted Race 500 *yd.*

1. S. Poyser (Victoria), *Rumpus* 4: 53.8 m.p.h.
2. C. Hancox (S. London), *Lady Joan*: 47.8 m.p.h.
3. H. Poyser (Victoria), *Rumpus* 3: 40.3 m.p.h.

Class "B" Race 500 *yd.*

1. G. Lines (Orpington), *Sparky* 2: 51.9 m.p.h.
2. M. de B. Daly (Blackheath), *Nipper*: 40.8 m.p.h.

Class "A" Race 500 *yd*

1. E. Clark (Victoria), *Gordon* 2: 62.3 m.p.h.
2. J. Benson (Blackheath), *Orthon*: 46.9 m.p.h.

Steering Competition

1. A. Clay (Blackheath), *Elizabeth*: 11 + 3 points.
2. J. Benson (Blackheath), *Comet*: 11 + 1 points.
3. W. Hood (Swindon), *Truant*: 9 points.
4. J. Chandler (Southend): *Iope*: 8 points.

A Farnborough Regatta

We are informed by the Farnborough Society of Model Engineers that a model power boat regatta is being organised in conjunction with the Royal Engineers' Aquatic Fete on August 16th at Hawley Lake. Members of model power boat clubs and also lone hands will be welcomed at this event. In order to assist visitors to find their way, the route will be marked with red sign-posts proceeding from the main roads. Many readers will remember the pre-war Farnborough regattas being held at Cove reservoir, which were always among the most popular events of the season. It will, therefore, be of interest to note that Mr. G. G. Harris and Mr. R. O. Porter, who were responsible for the organisation of the pre-war events, will also be assisting at this regatta. Further details can be obtained from the Hon. Secretary of the Farnborough Society, Mr. D. L. Jenkins, 16, Hurst Road, Hawley Estate, Farnborough, Hants.

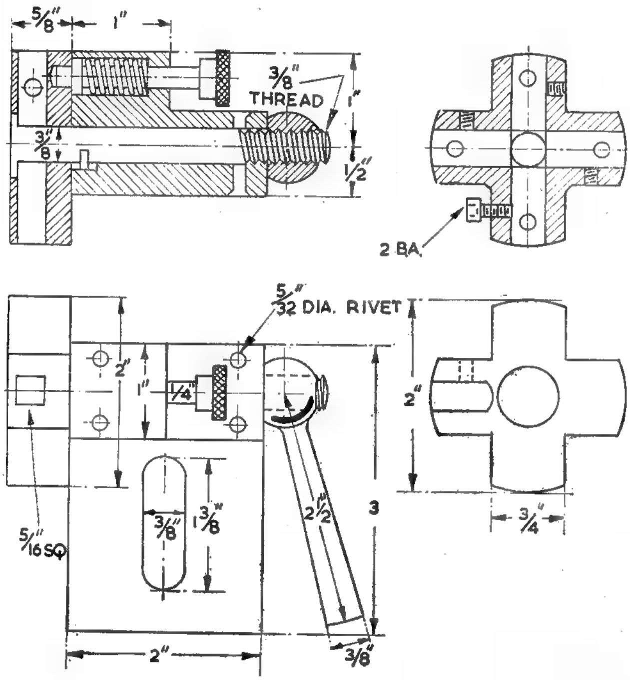
A VERTICAL TURRET

by F. G. Bettles

WELL, why make [redacted] vertical turret, when you may already have a horizontal one? Doesn't seem sense, does it; but it will, I think, later. I was turning out my cutter box during the war, looking for a bit of H.S. long enough to make a special tool, and there were over two dozen pieces, less than 1 in. long, no good for any holder I had, and it seemed a pity to commit these to the scrap-box. They were, therefore, put back, and for a time forgotten.

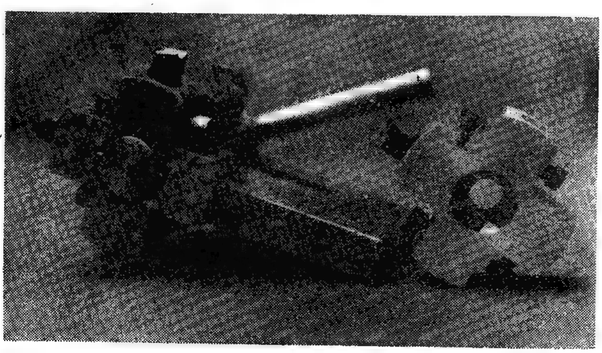
Then the idea came into my head to try out [redacted] small turret; but as this would not turn on the slide without altering the centre bolt (which I would not consider), I had to think of an alternative. Ah, why not try a vertical action? I made a sketch or two; it seemed all right by these, and my short pieces would all come in. A hunt in the scrap-box soon produced the odds and ends needed, but the 2 in. dia. mild-steel for the turret block had to be parted off [redacted] 6 in. length of shafting. Later I made another from dural, which is quite all right, too.

Now [redacted] few words on the construction. The 1 in. square piece is riveted down on the end of the 3/8 in. thick baseplate first, after cutting away the step on the right-hand side see drawings). The centres for the 3/8 in. clamping bolt are marked on each end and the hole drilled, starting from each end in turn, by putting the drill in the chuck and feeding up with the tailstock screw, starting with a 1/4-in. drill, and final 23/32 in. Now ream 3/8 in. The 1/4 in. hole for the register pin in the top is next drilled and recessed for the spring plunger. The turret is 2 in. dia., 5/8 in. or 11/16 in. wide, and cut away as shown. The square holes to hold cutters must be made to suit your tool steel bits (round holes are not advised). Be careful about centre height for holes; the top of the tool bits should come level with the centre, the slot should be filed upward a little to allow for packing the tool up after grinding.



The shoulder of the locking lever should be machined so that it locks the turret about 45 deg. up from the top of the slide, and mind the turret does not foul the edge of the slide either.

This tool is well tested, as it was made long ago and is used for making fittings, cylinder and other taps, screws, etc. It should be well made, then it will register equal to any horizontal type, and use those small ends which would, in the normal course of events, be thrown away as of no further use!



A COMBINATION FIGURE LOCK

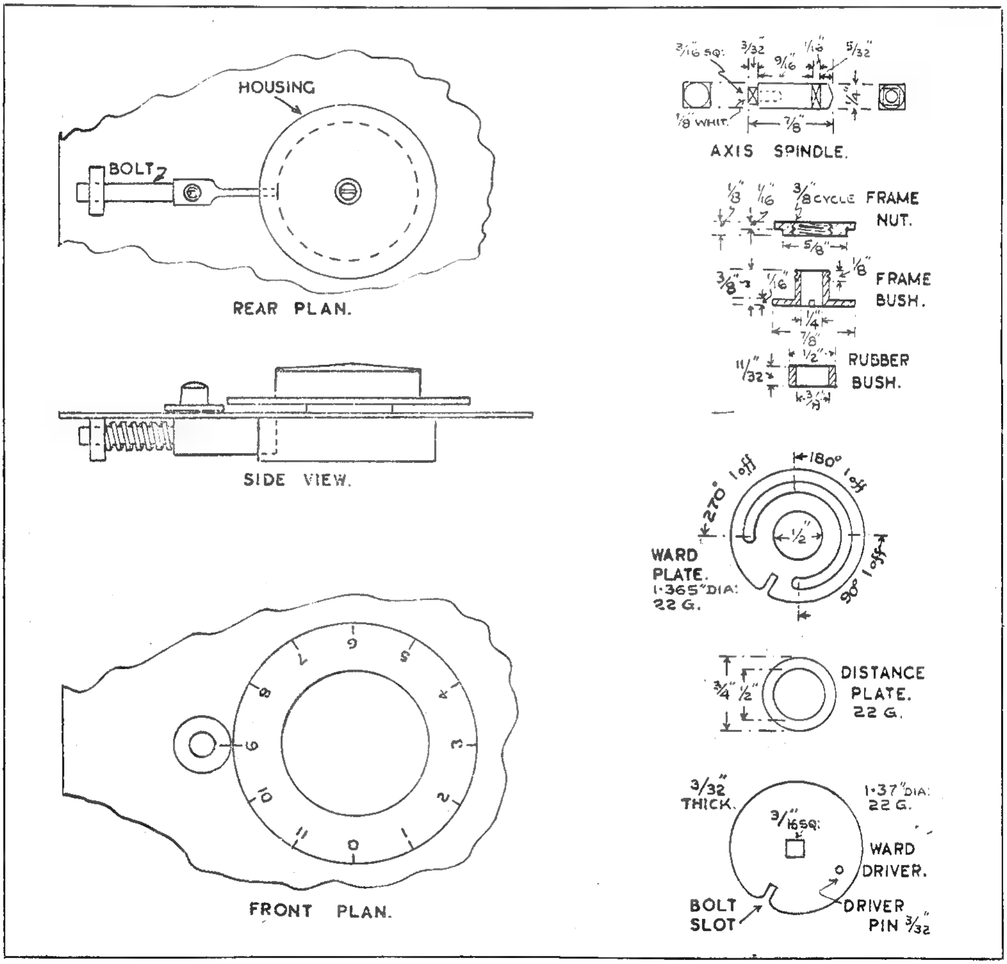
by A. D. Stubbs

THIS particular lock I designed for an ornamental brass box, with the operating dial central in the lid. The bolt registered in a recess milled away in the entablature of one of the box side pillars, a similar fixed hinge-bolt registering on a pillar at 180°.

On my finished assembly sketches, what was my box top is shown broken, leaving you to apply the fitting to your own needs. This box top I will call the "frame," and you will see that I carried the outer end of the bolt in a brass registering strip, $\frac{1}{2}$ in. × $\frac{3}{8}$ in. × $\frac{1}{8}$ in., drilled $\frac{3}{16}$ in. for the bolt. My brass register was sweated to the frame.

In applying the lock to, for example, wood, I suggest that a steel or brass frame sheet should carry the whole, and that the axis spindle, and the bolt knob should be extended to pass through your wood thickness.

Before getting to work it is necessary to get the hang of the manner in which the operating dial sets the ward plates. There are three ward plates. In my lock, one has a slot through 270° as sketched, the second has a slot through 180° and the third slot extends only for 90° These three ward plates are capable of being rotated by the ward driver pin, fixed in the ward driver, which in turn is driven by the dial knob through the axis spindle.



It will be seen that when the ward driver pin travels to the end of the slot in each ward plate it will, if rotation is continued, carry round all three plates. If it is stopped and reversed when the bolt slot in the plate having a 270° slot is in

line with the bolt, the dial knob can be rotated 269° before disturbing this first plate.

However, the second plate has a 180° slot, so the knob is rotated somewhere between 180° and 269° and at that chosen number, a bolt slot is cut in the second plate, in line with the first.

Now the third plate, having a slot of 90°, you can select a number within a range of five only, so the dial knob can be reversed to rotate in the first direction, and here slot your third plate.

The ward driver can now reverse up to 89° without disturbing either of the ward plates, each one of which now has its bolt slot in line with the end of the bolt. A bolt slot is cut in the ward driver at the selected fourth control number, and when rotation of the driver lines this slot to the bolt, the spring shown in my side view of the finished assembly pushes the bolt home, and the lock operates.

When so unlocked, only the last figure of the combination is visible on the dial, and to re-lock it is necessary merely to press forward the bolt with the bolt knob and give the dial knob a turn.

Your memory must therefore carry the formula "clockwise at least 270° and continue until 9 is in line with the bolt knob, then counter-clock to 6, clockwise to 5, counter-clock to 3". The first movement of "at least 270°" is necessary to ensure collection of all the ward plates. These numbers are, of course, figurative, as you will set each individual lock to a differing combination.

Just a little more about the mechanism before we start on the components. The number combination can be varied in a number of ways after the lock is completed. I show a bolt slot in the ward plate nearer one end of the pin slot. If this plate is assembled reversed, it will operate one dial number higher. The same applies to each of the plates, and the driver can be drilled to carry its driver pin at any sector, so upsetting the entire combination.

A quick alteration can be carried out by slacking off the screw in the axis spindle. Withdraw and re-set the dial knob at either 90°, 180° or 270°, made possible by the square hole in the ward driver. This, of course, advances or retards all numbers by 3, 6 or 9, but maintains the same differential.

Alternatively, remove the dial knob as above, unscrew the dial itself from its knob, and re-set it on its three screws at either 120° or 240°, giving a variation of 4 or 8.

A combination of both the above alterations can give you a variation to any number on the dial, but only reversal of the ward plates can alter the difference between the selected numbers.

Starting with the dial, you can either make and engrave your own, or acquire a clock face or instrument dial of about $2\frac{1}{2}$ in. diameter, re-arranging the bolt knob to suit any variation from my $2\frac{1}{2}$ in.

The dial knob in my design is unusual. This is because I always try to utilise scrap, and having found the discarded end of a $1\frac{1}{2}$ in. diameter brass shaft only $\frac{5}{8}$ in. long, I could not form the axis spindle with the knob. So I recessed the knob after centre drilling it for the spindle, and drilled two $\frac{1}{16}$ in. holes at 180°.

The axis spindle registers as a push fit in the knob, the $\frac{1}{4}$ in. square-holed dial plate registers on the spindle with two $\frac{1}{16}$ in. driver pins, and the round-holed dial plate acts as a keeper, being itself retained by a spring ring in the dial knob recess. Care must, of course, be taken not to let your drill run right through the knob. This method I preferred to a screwed spindle, as it avoids possible slackening of the thread; in fact once locked, only brute force can obtain unauthorised entry.

The lower end of the spindle is drilled and tapped $\frac{1}{8}$ in. Whitworth for a round headed setscrew, detailed in my section of assembly. This screw tightens up the whole dial-spindle-driver plate assembly, and is the last component to be fitted.

Reverting now to the frame, this requires a $\frac{5}{8}$ in. hole to accept the frame nut, and a rectangular slot in which the bolt knob slides. My frame detail sketch gives dimensions, the three holes for the housing-holding screws being drilled and countersunk to pass $\frac{1}{8}$ in. Whitworth setscrews.

My frame nut is sweated to the frame, and is screwed to take the frame bush. The frame nut is shown recessed for a 16-gauge frame, and if you utilise another thickness, this dimension, the length of screwing on the bush and the length of the axis spindle must be varied accordingly.

On the frame bush goes the rubber bush. For the rubber you can disregard my dimensions, because it will be easier for you to acquire a near size, and, if necessary, adapt the plate centre holes to suit. The only point is that when all the ward and distance plates are assembled over the rubber bush, the frame bush, when at the end of its thread, shall compress the rubber until all three ward plates are given sufficient friction to prevent them turning readily, but not sufficient to cause effort in turning the dial knob. This may need a little experimental work, but the frame bush can be "washered up" quite a lot.

Reference to my full section will show the three ward plates and three distance plates. It is essential that a distance plate is put on nearest the dial, this avoiding any possibility of the ward driver pin slipping out of the top ward plate slot. I turned all six plates out of sheet steel, 22-gauge. Probably the simplest way is to bore the centre holes, cut the sheet approximately to size, mount all six on a mandrel, and then turn the outside diameter.

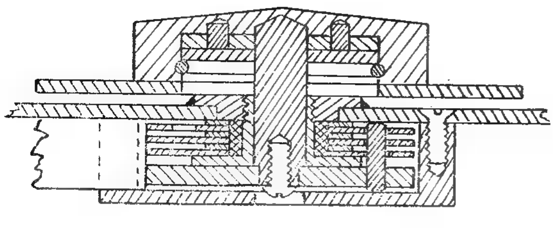
As my eyes are getting beyond accurate marking out I made myself what might be termed a drill bush. A $\frac{1}{2}$ in. bolt clamped to my vertical milling slide held a piece of $\frac{1}{4}$ in. steel plate, drilled $\frac{1}{8}$ in. at $\frac{1}{2}$ in. radius from the $\frac{1}{2}$ in. hole. Each plate in turn was mounted on the bolt, and a $\frac{1}{8}$ in. end mill cut the slot, the ward plate being rotated with a pin vice. The $\frac{1}{2}$ in. bolt was just skimmed down to enter the plates, and perhaps I should mention here that to a number of my dimensions you will have to apply Newall limits, as I have given nominal sizes.

The driver pin slots *must* give clearance to the 3/32 in. driver pin.

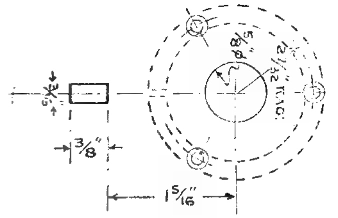
The ward driver is 3/32 in. thick, turned from brass plate, the centre hole being filed $\frac{3}{16}$ in. square. This plate is slightly larger than the ward plates, the advantage being that when the

dial knob is rotated one cannot "feel" the unlocking position of any ward plate. As the bolt would otherwise hang up in the ward driver to the extent of 0.0025 in., the circumference adjacent to its bolt slot is filed away, so enabling lock end being determined by my saw.

A drilled and recessed hole accommodated a cheese-headed setscrew which secures the bolt knob, the latter being turned from $\frac{5}{8}$-in. brass bar. As you will see in my sketch, the base portion



SECTION THROUGH BOLT.



FRAME. SOLID LINES
HOUSING. BROKEN LINES

the bolt to ride in an out until all the ward plates are correctly positioned.

The 3/32-in. driver pin, a bare $\frac{3}{8}$ in. long, is brass, soldered in its hole. The "bare" dimension of $\frac{3}{8}$ in. assumes a $\frac{3}{8}$ in. depth in your housing, and means a few thousandths clearance between housing and frame.

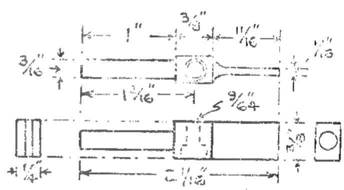
A piece of 2 in. diameter brass scrap formed my housing. This was badly marked, so I turned it down to $1\frac{13}{16}$ in. to clean it up, the recess being $1\frac{3}{8}$ in. × $\frac{3}{8}$ in. deep. As the total thickness of the housing is $\frac{7}{16}$ in., this gives a base thickness of $\frac{1}{16}$ in. only, in the centre of which a $\frac{1}{4}$ in. hole gives access to the spindle screw.

In the 7/32 in. wall of the housing three holes are drilled 120 deg. and tapped $\frac{1}{8}$ in. Whitworth for countersunk setscrews. My sketch of the frame detail also shows the $\frac{1}{16}$ in. slot in the wall of the housing, in which the bolt slides. Here, perhaps, I should point out that the ward plates have only 0.005 in. radial clearance, so to ensure accuracy, it is advisable to mark out the frame carefully, drilling this and the housing together.

The bolt slots in the four wards and the housing were cut with a $\frac{1}{16}$ in. slitting saw, and the possession of this saw determined the size. You can

registers in the frame slot and in this design the knob cannot be removed without access to the inner side of the lock.

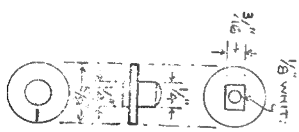
That completes the components. My lock has given no trouble, and I cannot see that any trouble should occur, but before I give the box



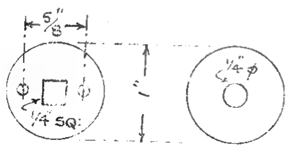
BOLT.

away I shall drill a 3/32 in. hole right through the axis spindle, and slot the inner end of the spindle screw for a screwdriver.

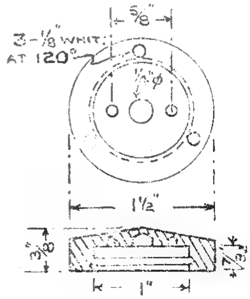
In the event of a failure I can then drill the dial knob centrally and proceed to dismantle from above, this eventually meaning a new dial knob.



BOLT KNOB.



DIAL PLATES.



DIAL KNOB.

vary the width very considerably and a decision is necessary before getting to work on the steel bolt. This is a nice little job in the lathe. I turned up the $\frac{3}{16}$ in. diameter end first, retaining sufficient stock for a hold, then finished off the remainder with a $\frac{3}{8}$-in. milling cutter, the $\frac{1}{16}$-in.

In my original design I made the ward and driver plates the same diameter precisely, turning the whole lot together, and the ward plates rotated on $\frac{1}{2}$ in. diameter steel plates two gauges heavier. This was not satisfactory, so was scrapped for the rubber bush, which is ideal.

A Simple Jig for Slotting Screw Heads

A NUMBER of $\frac{1}{4}$-in. B.S.F. and 2-B.A. cheese-headed screws were required recently during the construction of a small machine tool, and as these were of special form, standard screws could not be used. This is, of course, mainly straightforward turning and threading work, but the final operation of slotting the heads needs to be properly done to give a good appearance and to provide a secure hold for the screwdriver.

For this purpose, the small jig illustrated in Fig. 1 was made to take the two sizes of screws previously mentioned. However, to add to the usefulness of the device, it can be made to hold screws of a number of sizes in common use, as shown in Fig. 2.

The jig can be mounted either in the ordinary lathe toolpost or, as illustrated in Fig. 3, in the four-tool turret.

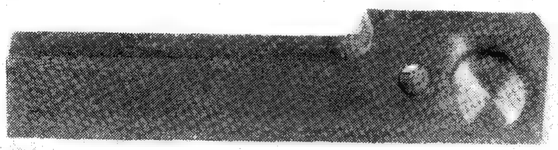


Fig. 1. The jig with a screw blank in place

In order to form the screw slots to an even depth, the mounting holes for the screws must be drilled on a line corresponding to the centre height of the lathe. After the material has been painted with marking fluid and then marked-out, it is hacksawed and filed to shape, but care should be taken to form a flat surface on the under side so that the jig will stand square when clamped in the toolpost.

The centre-line for the screw holes can be marked-out in several ways, but the easiest and most accurate is, perhaps, to grip a length of round material in the chuck and turn its end to a sharp point; the work is then mounted in the toolpost and traversed across this scribing point to obtain a marking.

Another method is to measure exactly the height above the surface of the toolpost of a tool set at centre height; this dimension is then transferred to the jig itself by using the jenny callipers.

When the centre-line has been marked-out, the mounting holes for the selected sizes of screws are drilled at regular intervals on the head of the jig. These holes should be made a reasonably good fit for the shanks of the screws.

It might be thought that the mounting holes should be threaded, but there are objections to this; it may be no easy matter to screw in and afterwards remove a small screw with a plain head, or the screw may have only a short threaded portion and a long, plain shank. At any rate, the unthreaded form of mounting works well in practice, and it has not been found necessary to secure even large screws in place with a nut.

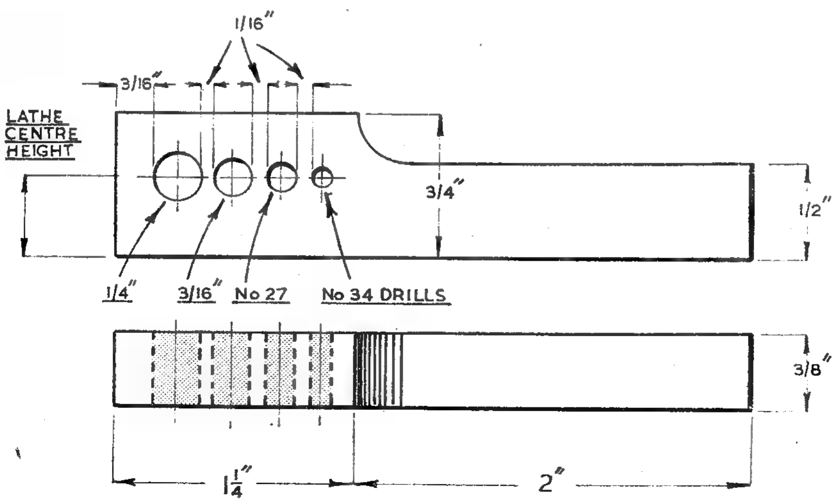


Fig. 2. A slotting jig to take four sizes of screws

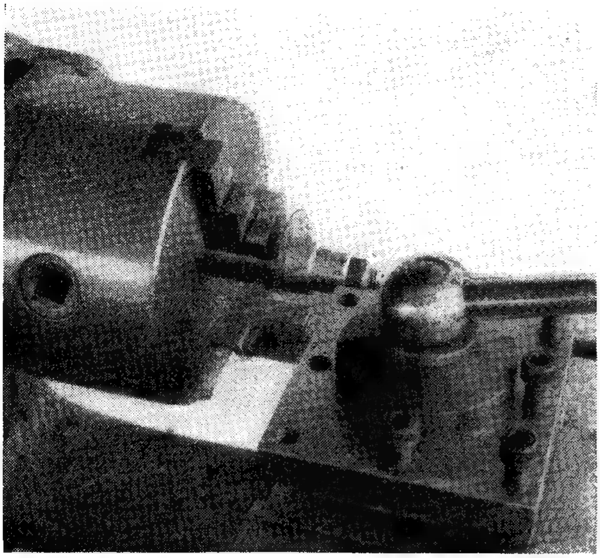


Fig. 3. The set-up for slotting screws in the lathe

Again, screws are, in some instances, slotted commercially by being fed into plain holes in a revolving drum so that, after being slotted, the screws fall automatically into a tray below the machine.

Slotting Saws

The next requirement is a suitable circular saw for carrying out the slotting operation. High-speed steel saws are recommended for this purpose, as they are usually of high quality, and the teeth are much stronger and less liable to damage than those of saws made of ordinary carbon-steel. The diameter of the saw need not be more than, say, 1½ in., for this will save expense and will allow the saw to be run at higher speed.

Best quality saws of this kind have been obtained from Messrs. Buck and Ryan, who list them ranging in thickness from 0.008 in. to 0.157 in. and in diameters of ¾ in., 1 in. and 1½ in.; the bore sizes are: ¼ in., ⅜ in., ½ in. and ⅝ in.

A thickness of 16-thousandths-of-an-inch will be found suitable for slotting small screws, and 24 and 32 thousandths for larger screws.

A Saw Arbor

If the saw is to cut effectively, it must be mounted to run truly and without wobble. To make the small arbor shown in the illustrations, a length of ¾ in. diameter round, mild-steel is gripped in the self-centring chuck and the diameter is reduced to ½ in. for a length of some 2 in. The work is now reversed in the chuck and a punch mark for future reference is made opposite to No. 1 jaw. The spindle is, next, machined to the dimensions given in the working drawing, taking care to make the seating a close fit in the bore of the saw, and the abutment shoulder exactly flat and square. A centre is also formed with a centre drill in case this may be required, to give additional support, when the arbor is used projecting for some distance from the chuck.

After removing the work from the lathe, two gripping flats are filed at the end of the shank, and the thread

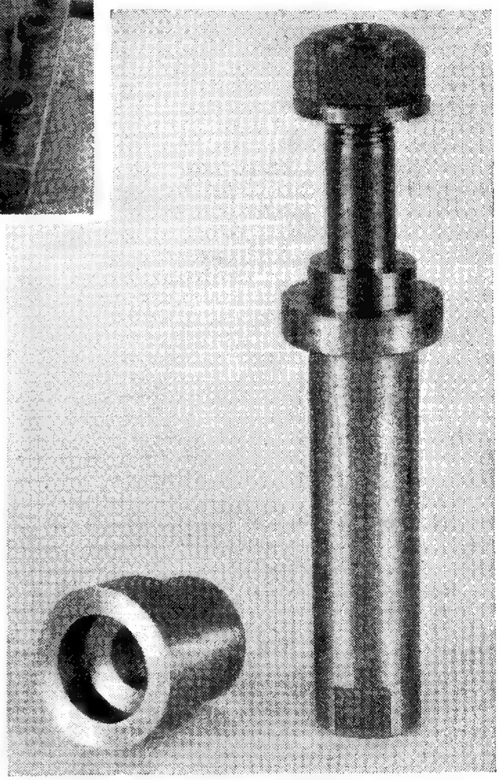


Fig. 5. The arbor with its clamping collar

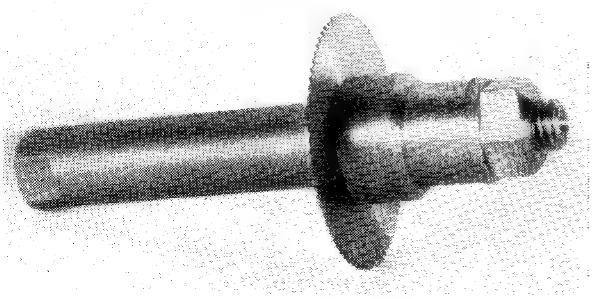


Fig. 4. The saw mounted on its arbor

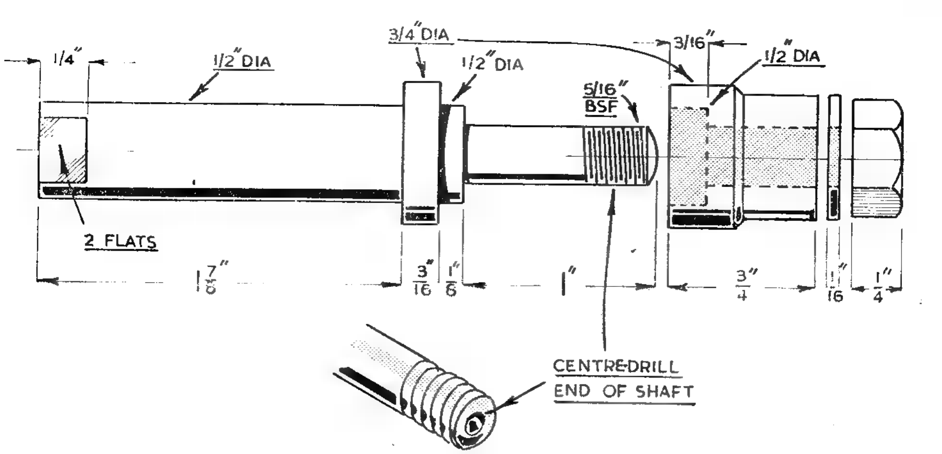


Fig. 6. Showing the dimensions of the arbor and its parts

is cut with a die, aligned with a guide collet, while the arbor is gripped in the bench vice. The spindle collar, which clamps the saw in place against the abutment shoulder, is turned from a length of $\frac{3}{4}$ in. diameter round, mild-steel. After being faced and drilled through to the clearing size, the collar is recessed to $\frac{1}{2}$ in. diameter for a distance of $\frac{3}{16}$ in., so that it can slide over the saw seat formed on the arbor itself. A standard $\frac{5}{16}$ in. B.S.F. nut and washer are then fitted, and the collar is clamped in place. The assembled arbor is, finally, again gripped in the chuck so that the outer end of the collar can be turned down to a shoulder to give a finished appearance.

Slotting the Screw

As a reminder of what has been previously described, the head of the first screw to be slotted is formed with a central pip to enable the screw head to be accurately centred against the saw. After the jig, with the aid of a square, has been set at right-angles to the chuck face, a screw is inserted, and its head is centred by traversing the topslide or the saddle ; this setting is preserved by locking these slides.

With the saw set to run at the low, direct speed of the lathe, the slot is cut to the required depth, and if the cross-slide index is now set to zero, there will be no difficulty in forming the slots in the remaining screws to a uniform depth.

When steel screws are being machined, cutting oil should be applied to the saw teeth with a brush.

To give a good finish to the screw heads and to make them all of equal length, mount the screws, in turn, in the chuck and take a light facing cut at a fixed setting of the saddle.

It should, perhaps, be pointed out that the purpose of reducing the diameter of the arbor shank to $\frac{1}{2}$ in. is mainly to allow the chuck jaws to close farther inwards, so that they keep clear of the projecting head of the jig ; also, when saws with a bore larger than $\frac{1}{2}$ in. are used, the diameter of the abutment shoulder should be correspondingly increased.

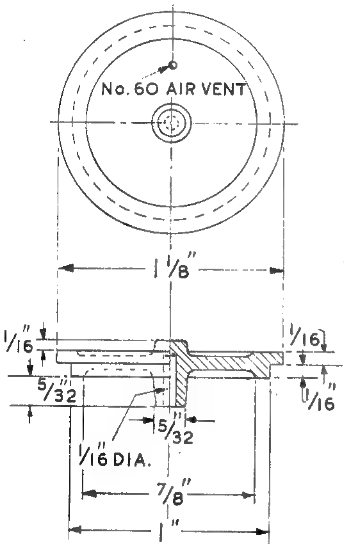
The Last Traction Engine in Bedfordshire

Mr. J. Crawley, of Bedford, has sent us some interesting particulars of what he has been told is the last agricultural steam traction engine in Bedfordshire. This engine, at the present time, is having new boiler tubes fitted at the local works of J. & W. Gower. It was built by Ruston Proctor & Co., Lincoln, and bears their No. 33471. The engine appears to have spent the whole of its time in Bedfordshire and is owned by Mr. W. Inskip, Cliftonbury, Shefford, Beds, in whose possession it has been for the past 15 years or so. When its present overhaul has been completed, it should be good for at least another four or five years ; that is until such time as the firebox needs renewal. Then it will most likely be relegated to the scrap-heap.

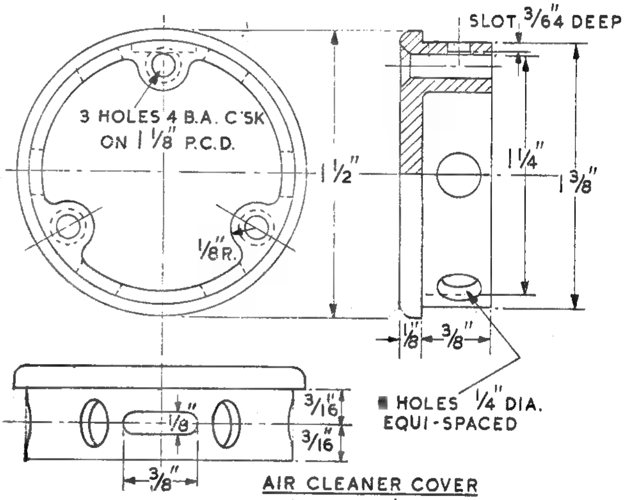
*A Carburettor for the "Busy Bee"

by Edgar T. Westbury

THE float chamber cover may be machined from a piece of aluminium alloy bar large enough to clean up to $1\frac{1}{8}$ in. outside diameter, and all the work on the underside surfaces may be carried out at one setting, prior to parting off. It will be seen that the $\frac{1}{16}$-in. hole which forms the central guide for the float needle does not pass right through the cover; this is optional, but the object of making the hole "blind" is to deter users from the common practice of flooding the carburettor to assist engine starting, which is not only unnecessary, but also messy and wasteful. After drilling the hole, it should be burnished out with a piece of steel rod, such as a knitting needle, a little larger than the diameter of the float-needle, to ensure that the latter is quite an easy fit and works smoothly in the hole. The spigot of the cover should not be made too tight a fit in the bore of the float chamber; in cases where it becomes necessary to remove the cover, it is very irritating to have to use tools to prise it out, and quite unnecessary from the practical aspect. After parting off, the disc may be held lightly in the chuck, over the spigot, for facing and recessing the top surface. All that remains then to complete this component is to drill the small hole which serves as an air vent to the float chamber.



FLOAT CHAMBER COVER
1 OFF L/ALLOY



AIR CLEANER COVER
1 OFF L/ALLOY

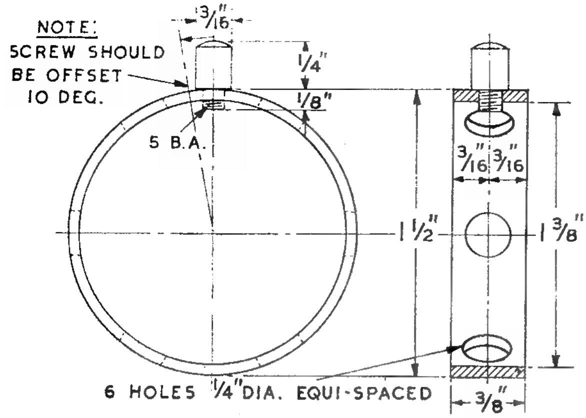
**Continued from page* 84, "*M.E.*," *July* 17, 1952.

Air Cleaner Cover

This is specified as a casting, but could be machined from alloy bar without much difficulty, the best method of shaping the inside to leave the three lugs for the fixing-screws being to bore out to maximum permissible clear size, which is $\frac{7}{8}$ in. diameter, and then end-mill out the unwanted material between the lugs; some method of indexing and partially rotating the work, such as a worm dividing appliance, is very helpful in this operation.

If, however, a casting is available, it is only necessary to chuck it by the rim, for facing the front surface, turning the outside and the face of the rim, at one setting. It may then be reversed in the chuck, a strip of copper or aluminium being used between the work and the chuck jaws, to prevent marking the finished surface, for cleaning up the outer face and the rim, the edge being rounded off as shown.

The three screw holes should be marked off on the inner face, at 120 deg., and coinciding as closely as possible with the centres of the lugs. After drilling, they are countersunk from the other side to take 4-B.A. screws, flush with the surface. The cover may then be clamped to the intake face of the body by a couple of small toolmaker's clamps, located as concentrically as possible (this can be checked by spinning the body in the lathe with the cover clamped in place) and the tapping holes in the intake flange



AIR SHUTTER 1 OFF L/ALLOY

spotted through the clearance holes. In case of any inaccuracy in the spacing of the latter, mark the cover to show which way up.

It is advisable to leave the drilling of the air apertures and milling the limit slot in the periphery of the cover, till the air shutter has been made, as these are best located from corresponding points on the latter.

Air Shutter

This is simply a ring of aluminium alloy made to fit over the air cleaner cover in such a way as to enable the air inlet apertures to be partially or completely closed when necessary. In the experimental stages, a band of strip metal, bent at the ends to form lugs to take a fixing screw, was used, and served its purpose fairly well, but was crude and unsightly. It is better to turn a ring from solid alloy bar or tube, as shown; this should be made a fairly tight push-fit on the outside of the cover, and its width arranged to just allow working clearance when the latter is fixed to the intake flange.

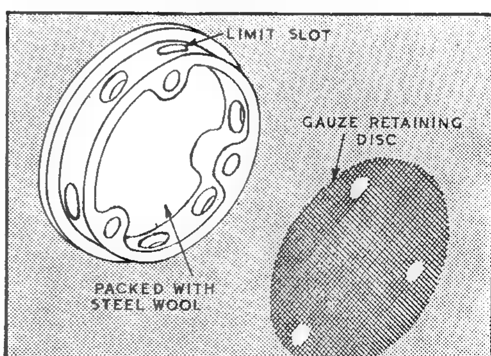
The six air apertures should be marked out on the ring, and it may then be fitted to the cover for drilling pilot holes only through both parts. If an attempt is made to drill the ¼-in. holes right away, there will probably be a good deal of snatching, and a burr will be thrown up which may jam the ring immovably, or at best cause bad scoring of one or both parts when it is removed. The ring should be detached for opening out the holes, and the best tool for this job is a piloted cutter or "pin drill," which will cut smoothly and cleanly, and produce a round hole—neither of which can be guaranteed if a twist drill is used. All burrs should then be removed from both parts.

A hole should then be drilled between the two uppermost holes in the ring and tapped 5 B.A. or ⅛-in. Whitworth, to take a special screw which forms both an operating handle and a limit stop. Although this screw is shown, for convenience, midway between two holes, it should actually be displaced about 10 degrees to one side to give the required range of movement. It will be seen that this projects through the ring, and a slot is formed in the air cleaner to allow just the right amount of movement to open or close the apertures. The ring should first be placed in position with the holes fully open, and a scriber used to mark through the tapped hole; it is then shifted to the closed position and another similar mark made. This will define the required width of the slot; if it is not convenient to mill the slot, ⅛-in. holes may be drilled at these points, and intermediately, and a small cross-cut chisel used to join them up.

Air Intake Design

It may here be advisable to give the reason why the air apertures are disposed radially around the air cleaner, instead of in the end face, as is much more common, and would appear to be more logical, as it conforms with the direction of air flow. This again, is an optional feature, but it is not done simply with the object of doing something "different." Most readers have, no doubt, heard the term "position errors," which is most commonly applied to clocks and watches, and refers to the influence of gravity on the time-keeping qualities of the movement, when it is placed in different positions. Great care and ingenuity is exercised by the makers of high-class movements to avoid or cancel out these errors. Quite so, say you—but what has this got to do with the design of carburettors?

The fact is that "position errors" can occur in this case also, and apart from the influence of gravity, which is, or should be, looked after by the float chamber, the other disturbing factor is the direction of natural or incidental air flow in the region of the carburettor. In this particular case, one cannot guarantee that the latter will always be fitted in one position relative to the direction of movement of the cycle or other vehicle to which the engine is fitted, or predict the precise effect of eddy currents around it. If one examines a number of motor cycle engines,



Air intake cover and gauze disc for retaining the steel wool filter element

it will usually be found that the carburettor position most favoured is with the air intake facing towards the rear. This may seem all wrong to many who study the theoretical aspect of design, and one of the most common (and fallacious) ideas for improving performance is to fit a large forward-facing scoop to the air intake, to utilise the forward movement of the vehicle in producing a "supercharging" effect. The reason why this usually fails is that the increase of air pressure obtained in this way, though too small in relation to induction pipe depression to influence performance to any marked extent, is subject to considerable fluctuation, often sufficient to upset the delicate balance of carburation on which efficient performance primarily depends. The effect can only be usefully employed when a considerable, and fairly dependable, airspeed is available, as in aircraft, and even then more or less elaborate air pressure balancing devices must be fitted to the carburettor.

Gusts play Havoc

In very small engines, the effect of gusts or eddies can play havoc with carburation (ask any of the speed boat enthusiasts!) and it becomes a matter of primary importance to eliminate or reduce them wherever possible. By placing the air inlets at right-angles to the direction of air flow through the main air passage, it is possible to ensure that, no matter where this is located relative to natural external air currents, the average intake air pressure remains substantially constant. The effect is much the same as the "static" element of a pitot tube, as used to measure airspeed. A common method of obtaining much the same effect is the air baffle or cowl fitted to many types of carburettors to modify or reverse the direction of air flow at the intake. No claim is made that anything original has been done in this particular design of intake, but I think that many readers, like myself, are interested in the "whys and wherefores" of the subject.

Filter Element

To complete the air cleaner, it may be fitted with the filter pad, which consists of a wad of steel wool, as used in domestic practice for cleaning culinary ware. A sufficient quantity is taken to fill the space in the cover fairly tightly (but not so that it must be rammed in by brute force), and this is rolled in the palms of the hands to coalesce the loose strands which might otherwise get in the apertures and jam the air shutter. The wad is held in place by a disc of coarse gauze or perforated metal, having holes punched in it to take the fixing-screws, and trimmed on the outside, flush with the edge of the intake flange.

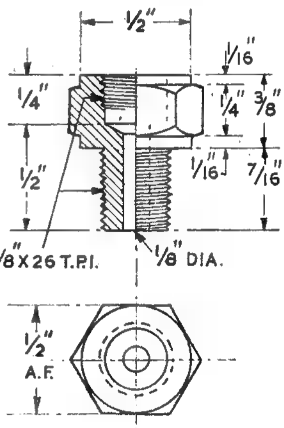
It will not be necessary in the case of a two-stroke engine with petroil lubrication to damp the filter with oil, as the occasional inevitable blowbacks will do this quite effectively; but an occasional wash out with clean petrol will not only ensure that it is kept in working order, but also provide evidence of the amount of foreign matter which it collects, and which would otherwise find its way into the engine. I have found metal dust, granite chips and glass splinters in the filter, not to mention dead beetles and other unclassified entomological specimens! The filter should always be fitted during engine tests, as its slight air resistance will modify the suction pressure and thereby influence the jet calibration.

It is, of course, permissible to modify the intake system as required to suit particular conditions of working or installation, such as by the addition of an air trunk to collect warm air from the region of the cylinder or exhaust pipe. Some form of air cleaner, however, is very desirable, to say the least, in any case. There are a number of proprietary air cleaners on the market which could readily be adapted, including *ex*-Service "surplus" types which are very elaborate, and presumably, of proportionate efficiency.

Incidentally, if the air shutter ring tends to work loose, this can be effectively cured by distorting it slightly before assembly so that it has to be sprung over the rim of the cover. This will ensure that there is sufficient friction to prevent inadvertent movement of the shutter.

Gland Housing

This serves both to secure the float-chamber to the jet housing, and also to carry the gland for the jet needle. As in the case of the jet housing, the important thing is to ensure that the threaded parts (in this case both external and internal) are axially true and concentric with each other. The lower end, with its external thread and centre hole, should be machined first, and reversed for facing, counterboring and tapping, being held by



GLAND HOUSING
1 OFF. BRASS

the threaded end in a "screw chuck"—in other words, a piece of stock held in the chuck and drilled and tapped concentrically *in situ*, the first thread or so being bored out to enable the component to screw right home to the shoulder, and thus locate it truly in both planes.

(*To be continued*)

Queries and Replies

Enquiries from readers, either on technical matters connected with model engineering, or referring to supplies or trade services, are dealt with in this department. Each letter must be accompanied by a stamped, addressed envelope, and addressed : "Queries Dept.," THE MODEL ENGINEER, 23, Great Queen Street, London, W.C.2.

Queries of a practical character, within the scope of this journal, and capable of being dealt with in a brief reply, will be answered free of charge.

In all cases, the fullest possible particulars of the problem should be given, and in the case of electrical queries dealing with windings, etc., all dimensions of rotor or stator slots, or space available on transformer limbs, and cross-section of cores, are essential.

More involved technical queries, requiring special investigation or research, will be dealt with according to their general interest to readers, possibly by a short explanatory article in an early issue. In some cases the letters may be published, inviting the assistance of other readers.

Where the technical information required involves the services of an outside specialist or consultant, a fee may be charged, depending upon the time and trouble involved. The amount estimated will be quoted before dealing with the query.

Only one general subject can be dealt with in a single query ; but subdivision of its details into not more than five separate questions is permissible. In no case can purely hypothetical queries, such as examination questions, be considered as within the scope of this service.

Queries involving the valuation of models, or any matters concerned with buying and selling new or second-hand models, cannot be entertained.

No. 9964.—Small Uniflow Engine
N.D.S. (S'ton.)

Q.—I propose to construct the steam engine described in the article on Utility Steam Engines, November 3rd, 1949, but am ignorant of designing parts, etc., and would be glad of your help :

(1) I cannot understand how the cylinder is held in place by entableture ring.

(2) Is entableture-piece part of the piece held by the four columns ?

(3) Using centre-flue type boiler, what is the minimum and maximum pressure for this engine ?

(4) Are the drawings in THE MODEL ENGINEER 3/11/49 full-size ?

(5) What metals are used for cylinder, piston, cylinder-head and valve body ? Could I use silver-steel for valve ? And may the valve spring be light in pressure ?

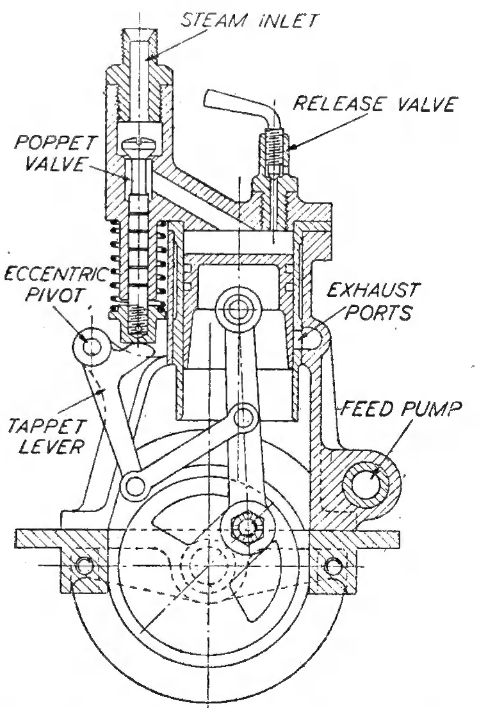
(6) Has the construction of the engine been described in any subsequent issue of THE MODEL ENGINEER ?

R.—(1) The cylinder and cylinder-head are held in place by four long studs which pass through both cylinder flanges and are tapped into the entableture. In the plan view of the engine which shows the section through the exhaust annulus, the four stud holes are shown in the four corners in the entableture.

(2) This component is extended to form the lugs bolted to the tops of the four columns.

(3) Whatever type of boiler is used, it is recommended that the pressure should not be less than 80 lb. p.s.i., as uniflow engines require a fairly high pressure for their efficient working.

(4) The bore and stroke of the actual engine are ¾ in. × ¾ in., but an engine could be made exactly to the size of the drawings quite satisfactorily.



(5) Cylinder, piston, cylinder-head and valve body could be made of cast-iron, though the engine shown had the valve body and cylinder-head made of steel, brazed together. Silver-steel can be used for the poppet valve, but high tensile stainless-steel would be more suitable.

It may be found necessary to experiment with the tension of the valve spring to obtain the best results.

No further description of this engine has ever been published, and no detailed prints are available.

No. 9953.—Welding Plant
G.C.H. (Pullborough)

Q.—I am anxious to build my own electric arc welding plant in the near future to weld up to $\frac{1}{2}$ in. thick metal. What should be the maximum current output from the plant for this sort of work, and what voltage would be best? I intend to use a d.c. generator for my supply. Would a compound generator be suitable for this or must it be a special type of "welding" generator? Should I need any special resistances in series with the arc, or would the normal shunt regulator of the generator be enough to control the current for various sizes of electrodes? Would such a "welding dynamo" be suitable for operating an electro-plating bath for nickel and chromium plating?

R.—D.C. generators for welding are special machines; an ordinary compound dynamo would not be suitable. The requirements for a welding generator are that it has what is known as a drooping characteristic, that is, the voltage must drop to a value after the arc is struck, and also it must be able to take care of a short circuit condition without trouble at the instant the arc is struck. Briefly, the generator has what would be called a strong armature with many turns, a rather small air gap, and the compounding would be arranged in reverse, that is, to have a tendency to cancel the field effect if excessive currents flow.

The voltages necessary for plating range from as low as $\frac{1}{2}$ a volt to about 5-6 as a maximum; this depends upon the metal being treated. In some cases very heavy currents are used, as in the case of some methods of copper plating. It would be possible to use a welding generator for plating by using a potentiometer fed from the generator, and in turn feeding the plating bath from this, but it would be rather a costly method.

No. 9963.—Electric Sewing Machine Speed Control
A.J.W. (Dover)

Q.—I intend electrifying my wife's sewing machine, and understand that the chief difficulty is the speed control. I shall be using a fractional a.c. motor, probably of the induction type, and require information on the form of variable resistance used. I believe it should not be of the stud type but should embody some sort of carbon resistance.

R.—The controlling resistances for sewing machine motors are usually of the carbon pile type, consisting of a large number of small carbon discs pressed together by a spring, the tension of which can be varied by means of a foot pedal. This type of resistance is one of the simplest, and at the same time most satisfactory in practice, for this particular class of work, but a wire-wound resistance could be used in conjunction either with a sliding contact or with tappings connected to a selector switch. This, however, would not be quite so convenient for operating by means of a foot pedal. The total resistance of the rheostat, in either case, should be fairly high, probably in the region of 800 to 1,000 ohms for working on 220 V mains.

PRACTICAL LETTERS

The Crofton Pumping Engines

DEAR SIR,—As the member who suggested to the Newcomen Society the testing of these old engines and in point of fact, did the bulk of the organisation and devised the gear required, I was naturally interested in the articles which have appeared recently.

The continued existence of these engines is simply explained. The Kennet & Avon for many years was owned by the G.W.R. and the railway had no interest in the canal's efficiency. It is, in fact, clear that the one aim was to get a certificate of abandonment for this beautiful waterway. More efficient pumping machinery, an essential if running expenses are to be reduced, had no attractions for the railway company. That is why the engines remain in service.

I regret to read in the second of Mr. Bradley's articles an example of what I believe Dr. Bronowski has termed "Emmetism" after the Punch artist. The Crofton engines have little but their age to recommend them and investigation into the operating cost will show that the economy of diesel or electric pumps would be so great that the latter could be bought from the proceeds of the scrap from the Crofton pumps, replaced every third year, if required, and still give a much reduced cost of pumping. The operation of these old engines is of small importance as compared with the revival of navigation on this beautiful waterway. Mr. Bradley attempts the impossible on page 786.

I am surprised, too, that in his description of the engines the writer completely misses the main features. Both engines operate on the Cornish Cycle, but whereas the later engine is true Cornish in that the pump is a plunger pump, and the delivery stroke made by the weight of the rods, etc., the original Watt engine when converted to the Cornish Cycle retained its bucket pump and the delivery stroke is made by steam pressure plus vacuum. When I first went over the engines I was puzzled by the valve-gear for a Watt engine, and it took some correspondence with the late Dr. Dickinson before he accepted the fact.

Obviously when the second engine was replaced by a Harvey engine in the 1840's the boiler pressure was raised by substituting more suitable boilers and No. 1 engine was coverted to Cornish Cycle.

I find it difficult to believe that any portion

of the engines was cast on site. The engine, *ex*-St. Catherine's dock, obviously came by canal which would be navigable to Wilton Water before pumping engines were needed. When the replace engine was installed the canal was in navigable condition to Bristol, and the Harvey engine would come by sea to Bristol and thence by canal to Crofton.

I asked Dr. Dickinson whether the engines were of sufficient interest to justify preservation and after some though he replied: No. In the interest of the continued existence of the canal, of far greater national importance than the existence of the engines, they should be scrapped and the proceeds applied to the installation of pumping plant whose running cost will enable the summit level of this beautiful canal to be kept at the 5 ft. depth that its designer laid down.

Yours faithfully,

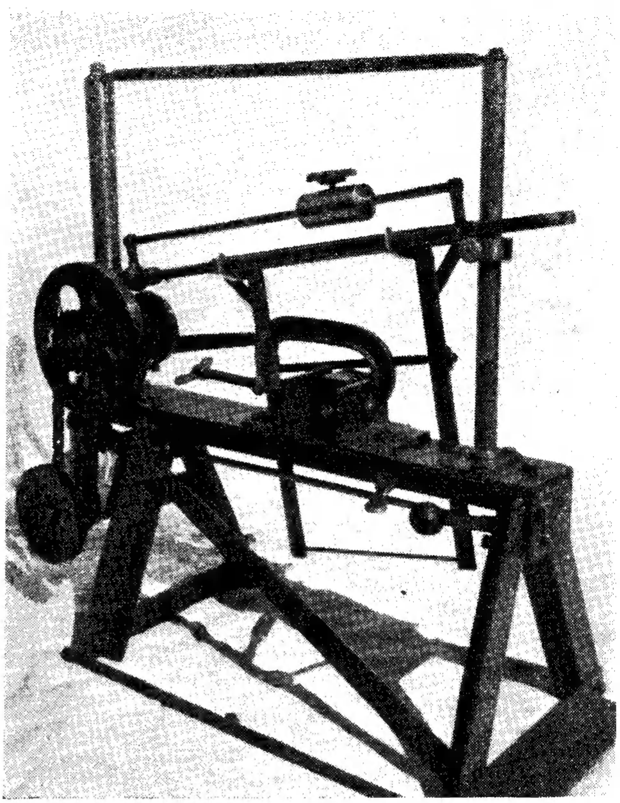
Devizes. KYRLE W. WILLANS.

Home-made Hacksaw Machine

DEAR SIR,—The photograph reproduced herewith is of a power hacksaw I have recently constructed in my small home workshop, which may be of interest.

You will probably recognise several features of this machine which have been gleaned from various articles in past years in your excellent magazine.

Some idea of the size of this machine can be gained from the 2 ft. rule at the bottom of the picture.



Mr. Whiteway's hacksaw machine

The main idea behind the construction of this machine was that it should be capable of sawing up long or short sections of various metals up to 5 in. square; also, be capable of cutting steel-plate to various shapes. I have, therefore, made provision for the blade to come to rest horizontally at any predetermined height from the bottom of the vice. Provision is also made for swivelling both vice jaws on the bed to allow for cutting off stock at various angles. The reason for adopting this very simple form of vice was to enable me to grip very short lengths.

The drive of this machine is taken through a 3-speed motor-cycle gear-box *via* a $\frac{1}{2}$ in. $\times$ $\frac{5}{16}$ in. pitch chain to the crankshaft, which has a 10 in. cast-iron fly-wheel and runs in ball-races. The crank-pin is threaded into the crank-disc, there being five positions for this, allowing for varying the stroke of the saw frame. The big-end is a roller-bearing while the small-end is a bronze bush.

As you can see from the picture, the saw frame is guided top and bottom of the 10 in. hand hacksaw blade.

The gear change is effected by the lever and round knob seen at the front of the machine. The gear indicator can also be seen.

The second lever under the vice is for locking the movable jaw while the machine is running.

Fitted to the bottom guide rail is a small platform which supports the piece of stock being sawn off, thus alleviating the annoying tendencies of most power hacksaws for the blade to run into the part being sawn off after it has very nearly sawn right through.

No claim is made for the originality of this design. Neither does it compare with production machines for speed of cut, although it compares favourably with them for squareness of cut. It has proved very adaptable in application. The ordinary hacksaw blades used (18 teeth per in.) last a surprisingly long time.

Although not usually considered necessary in this type of machine, the gear-box has proved most useful in prolonging the life of the blades; also, enabling the machine to be used on semi-hard steels such as car half-shafts, etc., by using the low gear (54 S.P.M.). The second gear is used for mild-steel etc. (100 S.P.M.), while top speed is used on brass and aluminium (150 S.P.M.).

Yours faithfully,

Paignton. N. WHITEWAY.

Old Steam Engines

DEAR SIR,—I have delayed rather long before writing you, but at last I have done so. The other day I had the pleasure of visiting Liverpool docks, and I was very surprised to see at least ten steam wagons, of which seven were in use. What few details I could obtain from the Overhead Railway are as follows :—

Three Sentinels near Nelson Dock Station alongside the railway, AW 8313, AW 8675? AW 437.

A Sentinel AW 427 at the power station.

Two more, KA 5574 and AW 5727, running oaded in the docks,

A steam granary wagon at "Worldlight Flour." Three wagons or tractors, one near Toxteth Station another near Wapping Dock Station, and another between there and Canning Dock Station BUJ 8.

Can any of your readers tell me the history of the old ploughing engine alongside the "Birmingham New Road" between Wolverhampton and Birmingham? It is on the right, when travelling in the above direction (W. to B.) on some waste land.

I found the articles about the "Crofton Beam Engines," very interesting.

On the road to Lichfield from the A5, on the left going to Lichfield, alongside the canal, is a building in which can be seen a large flywheel revolving. Can any reader tell me what it is, please?

Yours faithfully,

Wellington, Salop. JOHN E. BREWER.

Model Speed Boats

DEAR SIR,—I was pleased indeed to learn from your columns of the progress being made in the application of steam power to speed boats, and would like to wish Mr. Pilliner every success. I was relieved also that he thought my suggestions lacked precedent, as I rather gathered from "Artificer" in the June 5th issue that the reverse was the case! Seriously, however, there is a precedent for the suggestion in question. I refer to the rule which unhappily prevented the *Shamrocks* regaining the "America's" cup.

I am only pleading for boats to remain in or on the water as much as possible, and see no objection in a more handsome appearance coupled with a more sedate speed. However, I would cheerfully withdraw all my objections if the results of these races were recorded as "revolutions per minute round the pole," which would at once place the performance in its true perspective and include the credit due to the pole.

I maintain the true speed record should be made over a long straight course such as a disused canal, the boat being kept straight, but receiving no support, from an overhead guide fixed to the bank, the guide incorporating the timing and stopping devices. I hope to experiment on these lines when my club, the Tyneside S.M.E.E., completes the construction of its new lake, which will occupy the centre of the live steam track already completed.

Yours faithfully,

Newcastle-on-Tyne. J. W. LIDDELL.

Twist Drill Grinding

DEAR SIR,—Mr. G. Lines, in his letter in a recent issue, assumes infallibility in the maker of "a good quality drill of about $\frac{3}{8}$ in. to $\frac{1}{2}$ in. diameter," the starting point of his instruction. Does experience bear him out?

He also presupposes that drill grinding *can* be done "properly by hand" at reasonable cost in time—though, to me, "a couple of hours" per individual drill would not be reasonable. What is general opinion about this and what are known *facts*?

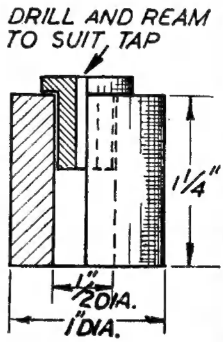
Yours faithfully,

Bristol. W. D. ARNOT.

Hand Tapping

DEAR SIR,—I was very interested in the article on "Hand Tapping" and feel that some of your readers may find useful a "tapping aid" that I have used.

I "discovered" the idea accidentally. By a fortunate coincidence there happened to be on my bench one day a short piece of steel bar with a hole bored down the centre into which someone had idly slipped a small flanged bush, an old drilling jig with hard steel bushes fitted, and a thick steel plate with a number of holes to be tapped $\frac{1}{4}$ in. B.S.F.



Seeing the three things together gave me an idea. The piece of steel was put in the lathe and the ends faced. A steel bush was made up to fit fairly tightly in the hole, and drilled and reamed to take the $\frac{1}{4}$-in. B.S.F. tap. By holding the block firmly over a hole to be tapped, the tap was held at right-angles to the plate until the thread was well started, when the block was removed and the thread then finished.

I now have a number of bushes made up to fit the original piece of steel, and provided that there is a flat surface at least 1 in. dia. round a hole to be tapped, I can tap any hole from 10 B.A. up to $\frac{3}{8}$ in. and be sure of getting the thread true without having to use a square or "judge by eye."

The sketch will show the construction. Sizes may be varied to suit materials available. Even the materials used are not important. The centre hole in the block must be square with the ends and the taps should be a "sliding fit" in the bush, which should also be a nice sliding fit in the block.

Yours faithfully,

Beckenham. R. J. KRAFFT.

Noise

DEAR SIR,—The car section of the North London S.M.E. society have, as you know, been rail racing for the last $3\frac{1}{2}$ years, the only club to do so regularly and have been running lately on the new type rail, and wish to have representation in the governing body you suggest.

Yours faithfully,

London, N.W.10. C. THORP.